

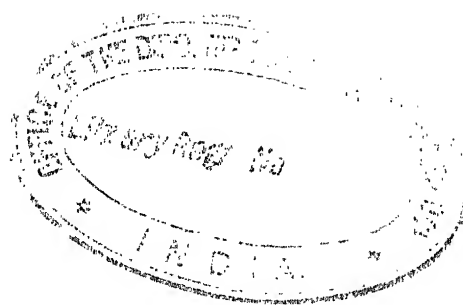
GOVERNMENT OF INDIA

DEPARTMENT OF ARCHAEOLOGY

**CENTRAL ARCHAEOLOGICAL
LIBRARY**

CALL No. 891.0959105/J.B.R.S.
25185

D.G.A. 79.



If you wish to become a member or to propose a friend for membership, you are requested to sign the attached slip and forward it to the Hon. Secretary. If not, please pass on the forms to one of your friends.

BURMA RESEARCH SOCIETY.

Patron:

HIS EXCELLENCY THE GOVERNOR OF BURMA.

THE BURMA RESEARCH SOCIETY was founded in 1910. Its objects are the study and encouragement of Art, Science, History and Literature in relation to Burma, and the promotion of intercourse between members of different communities with a common interest in such objects. Meetings are held periodically at University College, Rangoon, at which papers are read. The principal work of the Society is the publication of a Journal, which appears thrice a year and is supplied free of charge to members. Articles by well-known scholars such as Messrs. C. O. Blagden, C. Duroiselle and R. Halliday have appeared in the Journal, but the Editor is chiefly dependent for contributions on Burmese and English members of the Society stationed in various parts of Burma. The articles are mostly on Burmese history, archaeology, literature, art, language, philosophy, religion and folklore. They are of interest not only to scholars but also to general readers who are attracted by Burma and its people. The Editor welcomes contributions from members who have made a study of any special subject or locality. Illustrated articles and articles in Burmese are always welcome. Apart from its Journal, the Society is also publishing Burmese literary and historical works and translations, and in this branch of its activity enjoys the assistance of the best Burmese scholars. It possesses a growing library for the use of members.

The Society is dependent for its funds entirely upon the subscriptions of members. The subscription is Rs. 15 yearly, payable in advance, or a single sum of Rs. 150.

The Society invites applications for membership. Anyone who desires to join, may ask a member to propose him, or may write to the HONORARY SECRETARY, BURMA RESEARCH SOCIETY (Bernard Free Library), RANGOON. The attached form may be used.

To

THE HONORARY SECRETARY,

Burma Research Society,

(Bernard Free Library), RANGOON.

* I propose for election as a member of the BURMA RESEARCH SOCIETY the name of.....Designation.....Address.....

* I desire to be elected a member of the BURMA RESEARCH SOCIETY.

Name.....

Designation.....

Address.....



THE
GLASS PALACE CHRONICLE

OF THE
KINGS OF BURMA

(HMANNAN YAZAWIN)

TRANSLATED BY

PE MAUNG TIN

AND

G. H. LUCE,

Library Reg. No

INDIA

PUBLISHED BY THE OXFORD UNIVERSITY PRESS
FOR THE TEXT PUBLICATION FUND OF THE BURMA RESEARCH SOCIETY

The *Glass Palace Chronicle*, the most important of the native histories of Burma, was compiled in 1829, by a committee of scholars appointed by King Bagyidaw of Burma, who based their work on earlier chronicles, inscriptions, and other ancient records.

The present translation omits the first two parts of the Chronicle, as they merely retell the story of Buddhism and of the Buddhist kings of Ancient India, and begins at the point where the story moves to Burma. The third part opens with the history of the three Burmese kingdoms of Tagaung, Tharehkittara and Pagan. The fourth and fifth parts of the present volume cover perhaps the most interesting period of Burmese history, that of the kingdom of Pagan—the city on the middle Irrawaddy, a hundred miles below Mandalay, whose noble temples and vast ruins still astonish visitors. The volume closes with the fall of Pagan (1287 A.D.), consequent on the invasion of Burma by the armies of Khublai Khan. It is hoped that the response to this publication will justify the Burma Research Society in continuing the translation and adding notes in subsequent volumes.

ORDER FORM FOR MEMBERS ONLY.

**Special Reduced Price for Members of the B. R. S. Rs. 5 per copy
(in paper covers).**

To

THE HONORARY SECRETARY,
Burma Research Society,
(Bernard Free Library), RANGOON.

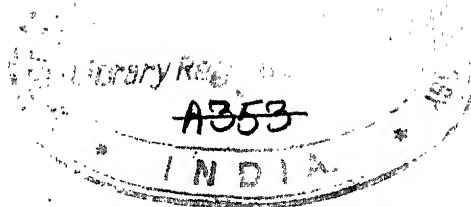
DEAR SIR,

I am a member of the Burma Research Society. Please send
me.....^{copy}_{copies} of the translation of the Glass Palace Chronicle
for which I enclose the sum of Rs....._{V. P. P.,}

Name.....

Designation.....

Address.....



ENGLISH RELATIONS WITH BURMA 1587—1686.

by

D. G. E. HALL.

	PAGE.
CHAPTER I.—The Earliest English Contact with Burma..	1
CHAPTER II.—The Episode of Thomas Samuel ..	11
Note I.—Coinage and Currency ..	22
Note II.—The Alleged Existence of English Facto- ries in Burma before 1647 ..	23
CHAPTER III.—The Foundation of the Syriam Factory and its early prosperity ..	26
CHAPTER IV.—The Failure of the Syriam Factory ..	39
CHAPTER V.—Conditions of Trade experienced by English Mer- chants in Burma in the 17th century ..	51
CHAPTER VI.—Sir Streynsham Master's Attempt to Re-open English Trade with Burma in 1680 ..	62
APPENDIX.—Extracts from the Fort St. George Consultation Books <i>re.</i> Sir Streynsham Master's Articles of Trade with Ava	73
Proceedings of the Society ..	80
Recent Additions to the Library ..	94
List of Members ..	96

891.0959/05 25185
J. B. R. S.

CENTRAL ARCHAEOLOGICAL
LIBRARY, NEW DELHI.

Acc. No. 25185

Date. 14.1.57

Call No. ~~891.05 / B.R.S.J~~

891.0959105

J.B.R.S

THE BURMA RESEARCH SOCIETY
(FOUNDED 1910)

*For the Study and Encouragement of Arts, Science, History and Literature
in relation to Burma.*

PATRON.

HIS EXCELLENCY SIR SPENCER HARCOURT BUTLER,
G.C.I.E., K.C.S.I., I.C.S.

COUNCIL.

President.

THE HON'BLE SIR J. G. RUTLEDGE, KT., K.C., M.A., *Barrister-at-law**

Vice-Presidents.

U SHWE ZAN AUNG, A.T.M., K.S.M.
THE HON'BLE MR. JUSTICE U BA, B.A., K.S.M.
J. S. FURNIVALL, ESQ., B.A., I.C.S., (Retired).

Honorary Secretary.

U E MAUNG, M.A., L.L.B., *Barrister-at-law.**

Honorary Treasurer.

A. CASSIM, ESQ., B.A.*

Honorary Editors and Librarians.

PROF. PE MAUNG TIN, M.A., B. Litt., I.E.S.*
PROF. F. J. MEGGITT, M.Sc., Ph.D., I.E.S.*

Executive Committee.

THE HON'BLE MR. JUSTICE	PROF. D. G. E. HALL, I.E.S.*
U MYA BU, <i>Barrister-at-law.</i>	S. G. GRANTHAM, ESQ., I.C.S.
U TIN, K.S.M., A.T.M.	W. G. FRASER, ESQ., I.E.S.
L. F. TAYLOR, ESQ., M.A., I.E.S.	C. W. DUNN, ESQ. C.I.E., I.C.S.
DR. G. R. T. ROSS, I.E.S.	G. H. LUCE, ESQ., B.A., I.E.S.
U PO SEIN, A.T.M.*	D. B. PETCH, ESQ., I.C.S.
U TUN PE, M.A.*	U SET, B.A.
D. J. SLOSS, ESQ., M.A.	PROF. W. N. ELGOOD, I.E.S.

General Committee.

J. L. MCCALLUM, ESQ., I.C.S.	R. C. J. SWINHOE, ESQ.
U THEIN	SAN SHWE BU, ESQ.
MAJOR C. M. ENRIQUEZ	CH. DUROISELLE, ESQ., M.A.
U KYI, O., B.A., A.T.M., K.S.M.	U THA TUN AUNG, B.A.
TAW SEIN KO, ESQ., C.I.E.	J. A. STEWART, ESQ., I.C.S.
H. F. SEARLE, ESQ., I.C.S.	U HLA, B.A.
DR. O. HANSON.	U THA KIN.
	G. E. HARVEY, ESQ., I.C.S.

*Members of the Sub-Committee.

ENGLISH RELATIONS WITH BURMA 1587—1686.

INTRODUCTORY NOTE.

This is the first attempt to tell the complete story of English relations with Burma previous to the embassy of Fleetwood and Lesly to Ava in 1695. Writers of Burmese History have relied almost entirely upon the valuable and interesting compilation of Dalrymple for their accounts of English relations with Burma. With the exception of the Fleetwood-Lesly episode and the subsequent embassy of Bowyear to Burma, however, practically the whole of the information contained in the *Oriental Repertory* is concerned with the Alaungpaya period from 1753 onwards. This is not surprising when one realises the vast range of Dalrymple's work and the extreme difficulty of collecting references to Burma from the East India Company's records previous to 1753. The records relating to Burma previous to 1753 are—apart from the exceptions mentioned above—not collected into any one series such as those relating to Siam in the 17th century. One has to search for them in the Original Correspondence, the Factory Records of Fort St. George, Masulipatam, Surat, and Java, the Home Miscellaneous series and other collections of papers too numerous to mention in a brief note. The task is not unlike the proverbial search for a needle in a haystack. Had it not been for the indefatigable labours of Sir William Foster and others in calendaring the bulk of the East India Company's papers up to the year 1667, it would have been next door to impossible for me to have given even the present meagre account of the Syriam factory to be found in Chapters III and IV. Many references to these calendars, and in particular to Sir William Foster's excellent series, entitled "The English Factories in India", will be found in the following pages. The first five chapters bringing the story to the year 1680 form the early portion of a work on English Relations with Burma from the visit of Ralph Fitch to the destruction of the Syriam factory in 1743 which I hope to publish before the end of the present year. The sixth chapter is in the form of a paper recently read by me to the Burma Research Society at its annual meeting. Hence the absence of footnotes. It carries the story from 1680 to 1686, and is based almost entirely upon information culled from the Diaries and Consultation Books of Fort St. George, most of which for this period have now been printed in extenso by the Madras Record Department.



ENGLISH RELATIONS WITH BURMA 1587—1686.

BY

D. G. E. HALL,

CHAPTER I.

The Earliest English Contact with Burma.

Burma, a land known to the ancient Greek geographers and touched by Roman commercial agents on their way to and from China, was entirely unknown to the peoples of Western Europe throughout the period of time from the fall of the Roman Empire of the West to the Renaissance—the Middle Ages of European history. Not until 1435 A.D. did the first European, of whom we have definite record, visit the land of peacocks and pagodas. This man, Nicolo di Conti, a Venetian merchant, landed first at the city of Tenasserim, then one of the chief ports of the East, since the small merchant craft of those days eschewed the dangerous voyage through the Straits of Malacca and travellers preferred to make the overland route between Tenasserim and Ayuthia, the ancient capital of Siam. Thence he went by sea to Arakan and across country “through mountains void of all habitation” to the Irrawaddy, “a river larger than the Ganges”. After a month’s voyage up stream he came to Ava upon whose throne Mohnyinthado (1427-40) was striving to maintain himself amidst the welter of internecine strife which characterised the “Shan period” of Burmese history. Conti wrote the first eye-witness account available to European readers.¹

At the end of the fifteenth century the Portuguese discovery of the Cape Route to India brought Burma within the scope of European enterprise, and it was not long before Portuguese adventurers were importing firearms into the country and fighting as mercenaries in its armies. The sixteenth century, the greatest era of Portuguese imperialism in the Indian Ocean, was no mean one in Burmese history. It witnessed the most determined attempt at welding the peoples of Burma into a unity made between the fall of Pagan in 1287 and the rise of Alaungpaya in 1754. Two of the greatest kings of Burmese history, Tabin Shwe Hti (1531-1551) and Bayin Naung (1551-81) were the contemporaries respectively of our Henry VIII and Elizabeth. The dynasty of the temple-builders, who between the accession of Anawrahta (1044) and the great Tartar invasions of the latter half of the thirteenth century had—to quote a recent writer—“made the sun-scorched wilderness, the solitary plain of Myingyan, to blossom forth into the architectural magnificence of Pagan”,² failed before the twofold pressure of the Shans and the armies of Kublai Khan. The refusal of the Burmese monarch, Narathihapate, to pay tribute to the Yunnan government in 1271 led to the occupation of Pagan with its sixteen square miles of

1. R. H. Major includes an English translation of the full text of this work in his “India in the Fifteenth Century” published by the Hakluyt Society in 1857.

2. G. E. Harvey: *A History of Burma* (Longmans 1925) p. 70.

temple and pagoda in 1287, and Burma relapsed into chaos. When the Tartars retired from what was in reality little more than a plundering raid, a number of petty princelets owing nominal allegiance to China, held independent sway over the various states into which the country split up. Their incessant wars and, at first sight, meaningless movements and countermovements do indeed revolve about one common centre of disturbance, but the confusion is so great that it is next door to impossible to view the details of Burmese history during the two centuries and a half following the fall of Pagan in their true perspective, unless we take the whole of Indo-China into our survey.

The thirteenth and fourteenth centuries in Indo-China witness the climax of the great racial movement of the Shans, the most numerous of the peoples of Indo-China at the present day. In 1229 the Shans founded the Ahom kingdom of Assam; a century and a half later in 1350 Siam,³ the largest of all the Shan states, had its origin. Burma too passed almost completely under Shan domination. The Shan invasions of Burma were not the overwhelming advance of an organised people. Like the slightly earlier Slav penetration into Europe they were a gradual infiltration of little bands of settlers swooping down upon isolated villages and slaughtering or driving away the inhabitants, while Shan adventurers like Wareru the pedlar,⁴ carved out small lordships for themselves from the wreck of the Pagan empire. But the Burmese of the north and centre and the Talaiings of the south steadily maintained their racial identity in face of this pressure, though the Pyu peoples of the centre disappear from history. The Burmese apparently were never completely submerged politically. When most of the country was ruled by Shan chieftains, there remained in the hill stockade of Toungoo a centre of resistance that the Shans could never reduce. Little by little as Burmese families fleeing from the Shan terror settled around its protective walls, Toungoo extended its power over the country round, until, in the fifteenth century, with the slackening of the Shan pressure, its rulers became predominant throughout central Burma.

With the accession of Minkyinyo to the throne of Toungoo in 1486 comes the end of the period of Shan aggression. His son and successor Tabinshwehti, reunited most of the ancient territories of Pagan under Burmese rule, but failed in the much greater task of giving them a unified administration. Still, under Tabinshwehti (1531-1550) and his successor Bayinnaung (1551-1581), the Bragino of contemporary

3. The word is a variant of the word 'Shan'.

4. Who after serving for a time in the elephant stables of a petty Siamese chief, aided a rebellious governor of Pegu—then peopled by the Talaiings—to drive out the Burmese, afterwards slew his ally and became king of Lower Burma south of Pegu and Toungoo with his capital at Pegu. (1287-96). Harvey, *op. cit.* p. 110 *et seq.*, Wood, *History of Siam*, pp. 54-55.

THE EARLIEST ENGLISH CONTACT WITH BURMA.

European literature, Burma attained to a measure of political unity unknown since the fall of Pagan. The conquest of the Talaings of the south led these two monarchs to plant their capital at Pegu. The selection of this city for such a purpose signified on their part a more enlightened attitude towards the outside world than had hitherto characterised Burmese royal policy. Its easy access to the sea rendered Pegu the natural resort of the travellers and trading prospectors of the sixteenth century. Tabinshwehti and Bayinnaung were not only anxious to develop trade between their dominions and the outside world, but were sufficiently enlightened to realise that the sea provided the only satisfactory approach to Burma for the traders of other nations.

During the reign of Bayinnaung there was a large influx of foreign merchants into Pegu; among them in 1569 came the Venetian traveller, Caesar Fredericke, who has left us the best description of Burma in the sixteenth century, that we have from a European source.⁵ An English translation of it by Thomas Hickock was published in 1588. Ten years later this was incorporated in Hakluyt's "Principal Navigations" along with the narrative of Ralph Fitch, the first recorded Englishman to visit Burma. Unfortunately for Fitch's reputation a comparison of the two accounts reveals the fact that he was indebted to the Venetian for by far the major part of his description of Burma.

Ralph Fitch⁶ visited Burma in the years 1587 and 1588. Born probably in 1550 he had left his native land early in the year 1583 on a general prospecting journey to the East from which he did not return until April 1591. Setting out with four companions from London on board a vessel named the *Tiger*, referred to in a well-known passage in Shakespeare's *Macbeth*, Fitch landed at Tripoli, and made his way overland down the Euphrates valley to Busorah on the Persian Gulf. Thence *via* Ormuz they travelled by sea to Goa "the most principall Citie which the *Portugals* haue in *India*, wherein the Viceroy remaineth with his Court."⁷ Here they were imprisoned as spies, but managing to make their escape, pursued their way across the Deccan through the kingdom of Golconda to the court of the Emperor Akbar at either Agra or Fatehpur.

At Fatehpur in September 1585 Fitch parted from his companions and continued alone on his journey down the Jumna to Allahabad and along the Ganges through Benares and Patna to Hugli. On the 28th November 1586 he embarked for Burma at the port of Serampore in a small Portuguese vessel which was so overcrowded, he relates, that "if any contrary winde had come, wee had throwne many of our things

5. I have used the Edition of it given in Purchas, Volume II (1625 Edition) pp. 1702. *et seq.* But see also the Maclehoose reprint, x, pp. 148—143.

6. D. N. B. s.v. Ralph Fitch.

7. Purchas, 1625 Edition, II p. 1732. See also Maclehoose Edition, x. p. 171.

overboard : for we were so pestered with people and goods, that there were scant place to lie in". Sailing southwards to Negrains point he entered the delta of the Irrawaddy by one of its westward entrances and landed at a town called by him Cosmin, probably near the site of the present port of Bassein.⁸ From 'Cosmin' he journeyed by way of the creeks to Syriam ('Cirion')⁹ then coming into prominence as the port of Pegu owing to the silting up of the Pegu river, which closed it to seaborne vessels from the end of the sixteenth century.

After a stay of several months in Pegu, Fitch made a twenty-five days' journey across to Chiengmai ('Tamahey') in the Lao states north of Siam, at that time hotly disputed territory between Burma and Siam. Returning to Pegu presumably at the end of 1587 he left for Malacca on the 10th January 1588. Here he stayed from the 8th February to the 29th March when he began his homeward journey *via* Pegu to Bengal, which he reached in November 1588.

Fitch's description of Burma owes so much to the previously published account of Caesar Fredricke that it has about it almost an air of unreality. One is tempted to wonder if he really did go there after all. Not only are his descriptions of places—particularly of the city of Pegu—and of custom such as the Burmese method of catching elephants obvious plagiarisms of the earlier work, but they come in exactly the same order as in the Venetian traveller's account. Thus both writers after describing the city of Pegu in almost identical terms, proceed to descriptions of the royal palace, the white elephants, the Burmese method of capturing wild elephants, the king's army and power, the propensity of the people of the delta region for eating serpents and other things considered by Europeans unfit for human consumption, the riches of the king, and the trade of the kingdom in the above order. Fitch's account of these phenomena differs from Caesar Fredericke's only in that he gives fewer details, so that his account often reads like a boiled down edition of the latter's. Only on a few points does Fitch stand with the charge of plagiarism not proven against him. His description of his journey from 'Cosmin' through the creeks to Syriam has no counter-part in Caesar Fredericke's account and indeed reads like an eye-witness account. Nor is he indebted to the Venetian writer for his interesting and faithful picture of the Buddhist monks of Burma.

Fitch's indebtedness to Caesar Fredericke can be clearly perceived by comparing a number of parallel passages from both authors. Quite apart

8. Purchas II, 1737. The writer of Fitch's life in the D. N. B. identifies this place with Bassein on the grounds that Cosmin is merely a corruption of Kau-Smin, the old Talaing name for Bassein. Some doubt, however, has been thrown by modern research upon the accuracy of this view.

9. The Burmese name is Than Hlyin after the supposed founder of the city in 500 B. C. The Talaing name was Trawn. Furnivall and Morrison (Burma Gazetteer, Syriam District Volume A, p 192) suggest that the English name has been derived from the Talaing through the Portuguese. See *Hobson-Jobson* s. v. Syriam for other suggested derivations.

THE EARLIEST ENGLISH CONTACT WITH BURMA.

from the question of plagiarism their interest is sufficient to justify their quotation *in extenso* here. Caesar Fredericke's description of the city of Pegu runs thus : " By the helpe of God we came safe to *Pegu*, which are two Cities, the old and the new, in the old Citie are the Merchant strangers, and Merchants of the Countrie, for there are the greatest doings and the greatest trade. This Citie is not very great, but it hath very great suburbs. Their houses be made with canes and covered with leaves, or with straw, but the merchants have all one house or Magason, which house they call *Godon*¹⁰ which is made of bricke, and there they put all their goods of any value, to save them from the often mischances that there happen to houses made of such stuffe. In the new Citie is the Palace of the King and his abiding place with all his Barons and Nobles and gentlemen ; . . . it is a great citie, very plaine and flat, and foure square, walled round about, and with ditches that compass the walls about with Water, in which Ditches are many Crocodiles. It hath no Draw-bridges, yet it hath twenty Gates five for every square in the Walls . . . "

Fitch's account of this is as follows :

" *Pegu* is a citie very great, strong, and very faire, with walls of stone, and great ditches round about it. There are two Townes, the old Towne and the new. In the old Towne are all the Merchants strangers and very many Merchants of the Countrie. All the goods are sold in the old Towne which is very great, and hath many suburbs round about it, and all the houses are made of *canes* which they call *Bambos*, and be covered with straw. In your House you have a Ware-house which they call *Godon*, which is made of bricke, to put your goods in for oftentimes they take fire and burne in an houre foure or five hundred houses : so that if the *Godon* were not, you should be in danger to have all burned, if any winde should rise, at a trice. In the new Towne is the King, and all his Nobilitie and Gentry. It is a city very great and populous, and is made square and with very faire Walls, and a great Ditch round about it full of water with many Crocodiles in it : it hath twenty Gates, and they be made of stone, for every square five Gates."

Writing of the royal palace at Pegu Caesar Fredericke says : " Within the gate there is a faire large Court, from the one side to the other, wherein there are made places for the strongest and stoutest Elephants, hee hath foure that be white, a thing so rare, that a man shall hardly finde another King that hath any such, as if this King knowe any other that hath white Elephants, he sendeth for them as for a gift. The time that I was there, there were two brought out of a farre Countrie, and that cost me something the sight of them, for that they command the Merchants to goe to see them, and then they must give somewhat to the

10. Godown, a warehouse. See *Hubson-Jobson* s. v. Godown.

men that bring them : the Brokers of the Merchants give for every man half a Duckett, which they call a *Tansa* which amounteth to a great summe, for the number of Merchants that are in that Citie."

Fitch deals with the same subject thus : " Within the first gate of the King's house is a great large roome, on both sides whereof are houses made for the King's Elephants, which bee marvellous great and faire, and are brought up to warres and in service of the King. And among the rest hee hath foure white Elephants, which are very strange and rare : for there is none other King which hath them but hee, if any other King hath one, hee will send unto him for it. When any of these white Elephants are brought unto the King, all the Merchants in the Citie are commanded to see them, and to give him a present of halfe a Ducat, which doth come to a great summe : for that there are many Merchants in the Citie."

Our next example is a particularly good one of the way Fitch occasionally summarises Caesar Fredericke. The latter begins his account of Burmese trade thus : " In the *Indies* there is not any merchandise that is good to bring to *Pegu*, unlesse it be at some times by chance to bring Opium of *Cambaia*, and if hee bring money hee shall lose by it. Now the commodities that come from Saint *Tome* are the onely merchandise of that place, which is the great quantity of Cloth made there, which they use in *Pegu*, which cloth is made of Bombast wouen and painted, so that the more that kinde of Cloth is washed, the more lively they shew their colours, which is a rare thing, and there is made such account of this kinde of cloth which is of so great importance, that a small bale of it will cost a thousand or two thousand duckets. Also from Saint *Tome* they lade great store of red yarne, of Bombast died with a root which they call *Saia*, as aforesaid, which colour will never out."

Fitch's précis of this passage runs : " In India there are few commodities which serue for *Pegu*, except *Opium* of *Cambaia*, painted Cloth of Saint *Tome*, or of *Masulipatam*, and white Cloth of Bengala which is spent there in great quantitie.¹¹ They bring thither also much Cotton, Yarne red coloured with a Root which they call *Saia*, which will never lose his colour : it is very well sold here, and very much of it cometh yearly to *Pegu*. By your money you lose much."

Fitch's last sentence would be difficult to understand were it not for Caesar Fredericke's much clearer statement on the same subject. Our last example is an excellent illustration of the danger of plagiarising a writer without taking strict account of the context of the borrowed passage. The Venetian, much impressed by the size of the Burmese armies that

11. This reference to Bengal cloth may possibly have been due to Fitch's own observation but it is significant that Caesar Fredericke in another passage writes : " Also there goeth another great ship from Bengala every yeere, laden with fine cloth of Bombast of all sorts "

THE EARLIEST ENGLISH CONTACT WITH BURMA.

were mobilised for service against Siam, was at pains to explain how it was possible to provision such large numbers of men on campaign. "The state of his Kingdome, and maintenance of his Armie," he writes, "is a thing incredible to consider, and the victuals that should maintayne such a number of people in the warres : but he that knoweth the nature and qualitie of that people, will easily beleue it. I have seene with mine eyes, that those people, and Souldiers have eaten of all sorts of wilde beasts that are on the earth, whether it be very filthie or otherwise all serueth for their mouths : yea, I have seen them eate Scorpions and Serpents, also they feed of all kinde of herbes and grasse. So that if such a great Armie want not Water and Salt, they will maintayne themselves a long time in a bush with rootes, flowers and leaues of trees."

Fitch's sole reference to this is contained in one sentence. "These people doe eat Roots, Herbes, Leaues, Dogs, Cats, Rats, Serpents and Snakes ; they refuse almost nothing." But although this sentence is sandwiched in the middle of his description of the King of Burma's military power it is in no way linked up with the sense of the passage in which it occurs. It appears as an isolated parenthetical statement without any relation to its setting, so that the reader who has not already seen the corresponding passage in Caesar Fredericke, can in no way account for the sudden intrusion of such a strange assertion. Both writers were keenly interested in state affairs and commercial matters. Their observations on these two subjects were undoubtedly of practical value to the traders of their day, and as such are of first-rate historical interest. Both emphasized the trading connexion between the Coromandel Coast and Burma as the most important source of the latter's imports : a fact made use of by the English East India Company in the following century. Both reflect the prevailing attitude of their age towards the precious metals in their awed descriptions of the King's "houses full of Gold and Silver" and "Mines of Rubies and Saphires and Spinells." The Spanish discoveries of bullion in central America earlier in the century, coming as they did at a time when the old sources of supply of the precious metals were practically exhausted, had so spectacularly increased the military power and political prestige of Spain, that the other powers of Europe were feverishly anxious to discover further new sources which they might exploit to their own advantage. According to the Bullionist theories advanced by the economists of the sixteenth and seventeenth centuries gold and silver constituted real wealth and it was the duty of governments to take all possible measures to accumulate stores of the precious metals. European trading and colonising ventures therefore in the sixteenth century were either directly or indirectly in search of bullion. Small wonder then that the travellers of that age, with imaginations fired by dreams of undiscovered gold, exaggerated beyond all bounds of reason the riches and power of oriental potentates. Caesar Fredericke speaks of the Burmese monarch as "exceeding the power of the great *Turke* in treasure and strength" and both writers assert

that he was continually accumulating more and more treasure.¹² Both too were careful to note that gold and silver were articles of commerce in Pegu, bought and sold like other merchandise and subject to fluctuations of price. But Fitch adds with the scorn of such things characteristic of the Englishman of his day, that the people of the country waste vast quantities of gold in gilding their pagodas and idols. "If they did not consume their gold in these vanities," he writes, "it would bee very plentifull and good cheape in Pegu."

These two fascinating accounts of Burma became accessible to the English reading public shortly before the foundation of the East India Company in 1600. Full of excellent tips to the prospective trader, they gave him useful political information and a reasonably sound description of such things as the external trade of the country, the methods of trading with foreigners practised in Burma, the products of the country, its monetary system, its ports and the best seasons for access to and egress from them. It is at first sight therefore somewhat surprising to find that the East India Company did not include Burma within the scope of its early voyages, especially when we find Fitch playing a not unimportant part as adviser to the Company in its early days. Actually, however, a study of the East India Company's records reveals the fact that, with the exception of a small venture despatched by Lucas Antheunis from Masulipatam to Pegu in 1617, with no real intention of establishing permanent trading relations, the Company made no serious attempt to open up direct trade with Burma until the establishment of the Syriam factory by Thomas Breton, Richard Potter and Richard Knipe late in the year 1647.¹³

The explanation is not far to seek. The desire to control the spice trade, or at least to secure to England a share in it free from foreign control, was the chief factor in the foundation of the East India Company, and almost the sole object of its early voyages. Burma produced neither spices nor the sort of goods that could be readily bartered for them in the markets of the East Indian Archipelago. She was obviously therefore outside the scope of such ventures.

But this was not the only reason for the Company's neglect of the Burmese trade. The Company was founded at a time when England was at war with Spain. In 1580 the crown of Portugal had lapsed to Spain and the great Portuguese Empire in the Indian Ocean was officially the possession of the arch-enemy of Elizabethan England. Notwithstanding the brilliance of the exploits of the Elizabethan seamen in the Spanish Main, England was in no position to develop a frontal attack upon the

12. Caesar Fredericke: "and every day he Encreaseth it more and more, and it is never diminished.

Fitch: "and bringeth in often, but spendeth very little."

13. *I'ide* Chapter III.

THE EARLIEST ENGLISH CONTACT WITH BURMA.

Portuguese in the Eastern Seas. Unlike the Dutch East Indian ventures, which were fostered and directed by the government of the United Provinces with the direct aim of destroying Portuguese power in the East, the English Company was a purely trading venture that could expect little or no active support from government. It sought therefore to avoid contact with the Portuguese by opening up trade with only such places as were not within the actual sphere of Portuguese trade. At the time of the foundation of the Company the question of the possible scope of its operations was at Elizabeth's request referred to the famous adventurer, Fulke Greville. In his reply he stated that the Portuguese traded to Arakan, Pegu, Siam, Tenasserim, and Quedda. Thus naturally the English merchants tended to give those places a wide berth. Notwithstanding the spectacular failure of Philip II's policy in the cases of England and the Dutch, the Portugo-Spanish Empire still remained intact, still appeared impervious to external attacks and gave hardly a sign of the internal weakness that was so soon to bring about the collapse of its Eastern section. A small merchant company without even a permanent capital upon which to float its modest and precarious ventures, could not afford to fall foul of the power which had controlled the Indian Ocean for a century, and still held all its chief strategic points. When the Company's first expedition set out for the East, the port of Syriam was in the hands of Felipe de Brito y Nicote, a Portuguese mercenary captain nominally in the service of Arakan, who took advantage of a period of disaster and anarchy in Lower Burma to seize Syriam, and hold up all foreign trade with the interior. De Brito had conceived the not altogether unstatesmanlike project of building up in Lower Burma a province of the Portuguese Empire. He seems to have been of the stuff of empire-builders. Had the Portuguese Empire not been in a moribund condition, his exploit might have had a different issue. As it was, however, the adventure was from the outset doomed to failure, though de Brito managed to maintain his hold upon Syriam for thirteen years from 1600 to 1613, and to confine all Burma's sea-borne commerce to that port alone. It was not to be expected, therefore, that during the period of his ascendancy the East India Company would entertain any serious thought of trading to Burma.¹⁴

After the death of Bayinnaung in 1581 his empire had rapidly fallen into a state of disintegration. The frantic attempts of Bayinnaung and his predecessor, Tabinshwehti, to conquer Siam before they had given really effective administration to their own territories were the chief cause of the ultimate failure on the part of the Toungoo dynasty to unify Burma. When the strong hand of Bayinnaung was removed, all the various vassal lords, who were in charge of the districts into which the realm was divided up, asserted their independence of the central

14. *Fide* Stevens translation of Faria Y. Souya's *Asia Portuguesa* Vol. III, Part II, Chapter V, VI, VII, and Part III, Chapter II. For a more detailed account of this episode see "A Brief account of the Kingdom of Pegu in the East Indies, a contemporary Portuguese work, a translation into English by A. Macgregor Esq., I.C.S., of which appeared in the *Journal of the Burma Research Society*, Vol. XVI No. II, August 1926.

government and plunged the country once more into a state of chaos from which Bayinnaung's weaker successor, Nandabayin, was unable to rescue it. Instead, he frittered away his few remaining resources upon further fruitless attacks upon Siam. During this period the region of the Irrawaddy delta, one of the richest agricultural districts in the world, and to-day the most thickly populated part of Burma, became hopelessly impoverished. Depopulated by famine and by constant requisitions of man-power to maintain the ever-dwindling numbers of Burmese armies flung away in abortive campaigns against Siam,¹⁵ ravaged by counter-attacking Siamese armies and those of her ally, Arakan, that portion of Burma which gave her her sole access to the sea and through which the trading prospectors of the sixteenth and seventeenth centuries entered the kingdom, had become almost a desert by the end of the sixteenth century. In 1600 a combined Siamese and Arakanese raid reduced the city of Pegu to ashes, and the Arakanese carried off into captivity a daughter of Nandabayin and a royal white elephant besides deporting some three thousand households from the Pegu district. The Jesuit missionaries who came to Burma in that year depict a scene of hopeless misery and ruin.¹⁶ The Siamese counterattacks had shorn Burma of her southern provinces, Martaban and Tenasserim.¹⁷ Little more than the district immediately surrounding the city of Pegu was under royal control, the rest of the country being parcelled out among a crowd of vassal "kings" unchecked by any central authority. Small wonder that Felipe de Brito and his motley crowd of *fringi* could seize and hold Syriam for thirteen years. Pegu never recovered its position as a great trading city. Its destruction in 1600 left Syriam the only important centre for foreign trade in Burma, but until de Brito's dominance was cut short, Syriam remained a closed port to English commerce.

In 1605 Anaukpetlun, a grandson of Bayinnaung and a man of great energy, came to the throne of Burma. He vigorously set himself to revive the central power and restore order in the country. Having secured the loyalty of the peoples of Upper Burma, he conquered the refractory vassal lords of the south. Finally in 1613 he succeeded in capturing Syriam where he put an end to de Brito's career by impaling him. He then began a series of heavy blows along the Siamese frontier which he temporarily pushed back beyond Chiangmai in the south-east and Tavoy in the south. Under him Burma regained some semblance of order and trade began to revive. Through Anaukpetlun¹⁸ the East India Company established its first direct communications with Burma.

15. Fitch mentions one's being launched during his stay in Pegu "At my being there, hee went to *Odin* (i.e. Ayuthia) in the countie of *Siam* with three hundred thousand men, and five thousand Elephants." These numbers are of course fictitious. The total population of Burma at that time has been estimated at less than three million souls. (Harvey *op. cit.* pp. 333-335.) This expedition was Nandabayin's third invasion of Siam which resulted in complete failure. Pra-Naret, the famous Black Prince, was then on the throne of Siam, and proved himself more than a match for the Burmese commanders. Harvey *op. cit.* p. 181.

16. *Vid.* Nicholas Pimenta in Purchas 1625 Ed. II, p. 746 and Boves in *ibid* II, p. 1748.

17. These remained in Siamese hands until reconquered in 1765 by Hsinbyushin the son of Alaungpaya, the founder of the last Burmese dynasty.

18. Sometimes known by his Indianised name, Maha Dhamma Raza.

CHAPTER II.

The Episode of Thomas Samuel.

The story of the East India Company's earliest contact with Burma is not lacking in romance. In 1610 the Directors decided to establish trading relations with Siam. In the following year therefore the Company's seventh voyage was equipped and despatched. The factors in charge of it were instructed to open up trade with the Coromandel Coast, proceeding thence to Patani on the East coast of the Malay Peninsula, in the territory of Siam, and to Ayuthia, the capital of Siam.¹ The management of the venture was placed in the hands of two Dutch merchants known respectively as Peter Floris and Lucas Antheunis, who together contributed one-eighth of the total capital involved. Pieter Willemszoon van Elbingh, who assumed the name of Floris presumably as a disguise on entering the service of the East India Company, had had previous experience of the East in the employment of the Dutch East India Company. In 1608 he had visited Arakan and there had seen the daughter of Nandabayin of Pegu and his royal white elephant, part of the Arakanese booty carried off from Burma on the occasion of the great raid in 1600.²

It is interesting to note in passing that the establishment of factories on the Coromandel Coast and in Siam was regarded by the promoters of the voyage as not merely a desirable object in itself, but as part of a scheme for opening up trade with Japan. The leaders of the expedition were ordered to "send one or two of our factors in such convenient shipping as you may procure to carry his Majesty's letters unto the King of Japan, together with such stock of merchandise and commodities as we have appointed our said principal merchants to provide for that purpose."³ The financial success of its early voyages had made the Company anxious to widen the scope of its trade, and it was beginning to put out feelers in new directions.

Floris and Antheunis with the merchants and cargo of the Seventh Voyage left England on board the *Globe* on the 5th February 1611. In the following August they arrived at Ceylon. Thence they sailed up the Coromandel Coast putting in at Pullicat, Pettapoli and Masulipatam in order to buy cotton goods for sale in Bantam and Siam. In Masulipatam they founded a factory destined to be for a time the principal station through which the East India Company's trade to Burma was conducted. Then leaving the coast of India, they proceeded by way of Bantam on the island of Java, to the port of Patani, whither they arrived on the 23rd June 1612.

1. Often called Judea or Odia by the European writers of the 16th and 17th centuries. It was destroyed by the Burmese invasion of 1767, after which date Bangkok became the capital of Siam. Vide *Job on Jobson s. v. Judea, Odia*.

2. P. recha, Maclehoze Ed., III, pp. 319-342. Danvers and Foster: Letters received by the East India Company from its servants in the East. III, p. 318, note.

3. Birdwood and Foster: First Letter Book of the East India Company, p. 387

From Patani five of the factors were sent on ahead to Ayuthia ;, they were Lucas Antheunis, Adam Denton, Thomas Samuel, Thomas Driver and Thomas Essington. At Ayuthia they were well received; ⁴ there seemed to be an excellent prospect of opening up trade both with the interior and with Japan. Antheunis therefore decided to send Thomas Samuel and Thomas Driver to Chiengmai⁵ in the Lao country north of Siam "to discover the Trade of that Country."⁶ With them went "a cargason of goods" which they were to endeavour to sell.⁷

They left Ayuthia probably early in 1613,⁸ the year in which Anaukpetlun had captured Syriam and put to death the Portuguese adventurer, de Brito. Immediately after this exploit the victorious King of Burma began his series of attempts to regain from Siam the ancient Burmese territories of Martaban, Tenasserim, Tavoy, and Chiengmai. In 1615, after having reduced Martaban and Tavoy, though unsuccessful in his attack upon Tenasserim, he captured Chiengmai, placed one of his vassals upon its throne, and returned to Pegu with prisoners and booty. Among these was Thomas Samuel with the unsold remainder of his goods.

The reason of Samuel's long absence at Chiengmai is unknown. From a letter dated the 27th August 1615,⁹ written by Lucas Antheunis shortly before his departure to Patani in that year, and left behind to be delivered to Samuel on his return to Ayuthia, we learn that when the latter had been pressed to return to Ayuthia because of the unwillingness of the factors to continue with the Chiengmai venture, he stayed on there sending back his companion, Thomas Driver, with the proceeds of the sale of part of his goods, "gold badly conditioned without any factory thereof, only by small bills or screets found in the bags." His answers to Lucas's letters are complained of as having been unsatisfactory and his accounts badly kept. Lucas accuses him of being "exceeding negligent, being your only fault (*i.e.* entirely your fault) to have tarried there so long, to no small hindrance and prejudice to the Company."

It is open to doubt whether Samuel's prolonged absence was due entirely to his negligence. The probability is that in the unsettled state of the country, due to the Burmese invasions, he could not get transport for his somewhat bulky goods and lingered on after Driver's departure in order to stand by the Company's merchandise that had been entrusted to him. Driver, on the other hand, would not find it so difficult to get

4. Anderson : *English Relations with Siam in the Seventeenth Century*, p. 49.

5. *Vide* Hobson-Jobson s. v. Jangomay for variants of this word used by European writers of the 16th and 17th centuries. The Burmese name for Chiengmai is Zimme.

6. C.S.P. C.I.E., Nos. 756, 771. Purchas : *His Pilgrimage* (1626 Ed.) Vol. V, p. 1006.

7. *Letters Received* V, No. 582.

8. *Ibid* II No. 113 and III p. 322.

9. *Letters Received* III pp. 152-156.

through to Ayuthia with the gold, which, according to Antheunis, weighed only some 614 taels.¹⁰ That the Burmese invasions had made peaceful travel almost impossible fairly soon after Samuel and Driver reached Chiengmai may be gathered from a letter written by John Gourney to the Company from Patani in July 1614. "The trade" he says, "betwixt Siam and places in the land, as Langjam¹¹ Jangama,¹² Pegu etc., have their passages so stopped by the Ava king of Pegu which maketh war against the King of Siam, that we shall be fain to embark and disperse to great value to Camboja, and where we understand trade may be made.¹³ When Antheunis wrote his letter to Samuel he was extremely annoyed at being unable to close the accounts of the Seventh voyage because of Samuel's absence. When we bear in mind that Antheunis was one of the largest shareholders in the concern, it will be impossible to take his remarks as seriously as they read.¹⁴ I prefer to think that finding it impossible to move his goods from Chiengmai, he chose to remain with them rather than, by escaping to Ayuthia without them, face the almost certain charge of breach of trust.

In Pegu Samuel appears to have been well treated and to have been allowed to carry on trade with the goods still remaining over from the Chiengmai venture. Not long after his arrival, however, he died. In accordance with Burmese custom his property escheated to the crown, but as the major portion of it belonged to the East India Company, it was held pending an appeal from the Company for its restoration. An inventory of the goods was drawn up and steps taken to collect the dead man's debts. News of this in due course was brought to the Company's factory at Masulipatam by Muslim merchants engaged in the trade between the Coromandel Coast and Pegu. By a curious coincidence Lucas Antheunis, who had in the first instance despatched Samuel upon his ill-starred adventure, was at that time (1617) the Company's agent at Masulipatam.¹⁴ He decided to send in a claim to the court of Pegu for the restoration of the Company's goods. Two of his assistants, therefore, Henry Forrest and John Staveley, were despatched to Burma on board a trading vessel belonging to the King of Golconda¹⁵ to undertake the recovery of the goods. On the 10th September 1617 they departed from Masulipatam taking with them "six pees of stametts"¹⁶ valued at 534 pagodas 13 fanams and 2 $\frac{3}{4}$ cash¹⁷ to "beare the charge of the voyage and make

10. The Chinese ounce, $\frac{1}{16}$ of a catty. 100 catties = 133 $\frac{1}{2}$ lbs. avoirdupois. So we may take the tael to be about $\frac{2}{3}$ of an ounce. 614 taels therefore would be slightly less than 29 lbs. avoirdupois.

11. Luang Prabang.

12. Chiengmai.

13. Letters Received: Vol. II. No. 159.

14. Purchas (1626 Ed.) Vol. V. p. 1006.

15. "A Kinges ship of this country" O. C. No. 680.

16. A kind of piece-goods.

17. Letter of Thos. Jones at Masulipatam to George Ball at Bantam dated August 16th 1618, in Foster: English Factories in India 1618-1621, pp. 43-4. See also Note I on 'Coinage and Currency' at the end of the present chapter.

tryall of the Trade."¹⁸ With them also was sent that most indispensable accompaniment to all missions in the East, a present for the king.

After slightly over three weeks in the Bay of Bengal, Forrest and Staveley arrived on the 3rd October at Syriam, the port of Pegu.¹⁹ The story of their sojourn in Burma taken from their letters to Masulipatam, has been told by William Methwold²⁰ in his admirable "Relations of the Kingdome of Golchonda" written in 1623, and published by Purchas in the supplement to the fifth volume of his monumental work in 1626. Before we continue with the story of Forest and Staveley, something must be said about the too little known author of this paper. A nephew of Sir William Methwold, Lord Chief Baron of the Exchequer of Ireland, who died in 1620, William Methwold entered the East India Company's service in 1615. During his early years in the employment of the Company he travelled widely, being the first Englishman to visit the famous diamond mines of Golconda. In the summer of 1618 he succeeded Adam Denton²¹ as chief of the factory at Masulipatam, and although under sentence of recall for alleged private trading, he held that office until October 1622, when he left for England *via* Batavia to answer the charges brought against him four years earlier.²² He was reinstated in the Company's service, and in 1628 became a "free brother" (*i.e.* director). In 1623 he became President at Surat and during an arduous five years of office proved himself one of the ablest and most energetic holders of that office in the first half of the seventeenth century.²³ In 1639 he returned home on board the *Mary*. His career culminated with his appointment as Deputy Governor of the Company in 1650, three years before his death. It is particularly unfortunate that his valuable "Relations of the Kingdome of Golchonda" should have appeared in Purchas. His Pilgrimage, the fifth volume of the Pilgrimages, since this volume, which consists of Purchas's symposium of all the original papers previously collected by him into a sort of general history with marginal references to the sources of his information, does not appear in modern reprints. In his introduction to Methwold's paper Purchas explains that it came into his hands too late for publication in the earlier volumes of

18. William Methwold "Relations of the Kingdom of Golchonda, and other neighbouring nations with the Gulfe of Bengala, Arracan, Pegu, Tannassery, etc. and the English Trade in those parts. In Purchas His Pilgrimage 1626 Ed. V., p. 1006.

19. *Ibid* p. 1006.

20. *Vide* D. N. B. s.v. William Methwold. The "Original Correspondence," and the "Factory Records: Surat" contain many references to him, most of which are accessible in Foster: English Factories in India. In his introductions Foster gives much supplementary information about Methwold, that is not to be found in the D. N. B.

21. Who proceeded to Patani. For his subsequent career in Siam *vide* Anderson, *op. cit.* pp. 73-4, 77, 88-91.

22. On this part of his career *vide* especially Foster, *op. cit.* 1618-21 Introd. p. XLIV and 1622-23 Introd. p. XXXIX.

23. Foster, *op. cit.* 1630-33 Introd. pp. XXXII-XXXIV. In November 1635 the Company wrote to him expressing their appreciation of his services. He was thanked for his "well written and digested" letters, his efforts to prevent private trade, his financial administration and his establishment of good relations with the Portuguese.

the work. "Now for Master Methold"²⁴ he writes, "I had spared some of Frederikes, Balbies and Fitches Relations, if these had comne in time, which so many times I had both by messages and in person sought, and by reason of the Authours absence or business was frustrate."²⁵

Methwold illustrates his account of Forrest's and Staveley's visit to Burma by long verbatim extracts from their letters to Masulipatam, describing in graphic terms their "entertaynment" during the early months of their unduly lengthy stay in the country. They constitute the next eye-witness account after Fitch's written by Englishmen of Burma. Their intrinsic interest combined with their general inaccessibility is sufficient excuse for quoting them in full here.²⁶

"The King hearing of our comming sent foure Galliot: with Presents to the Ambassador²⁷ and unto us, sending us word that he did much reioice at our comming into his country. These Gallies having oares of a side,²⁸ with eight Noblemen in them, caused our ship to come to an anchor before the town of Siriam,²⁹ the 7 of October the King of Pegues Brother being chiefe Gouverneur, sending two Noblemen aboard of our ship, writing our names and our age of yeeres and the cause of our comming, wee assuring them that wee were messengers sent from Masulipatam by our chief Captain, having a Present and a Letter unto the King, which when his Highness shall be pleased to receiue, shall understand the effect of our business, and the cause of our comming. The tenth day of October wee were sent for on shoare by the Kings Brother who sitting in a large house of Bamboson,³⁰ in great state bedeckt with jewels in his eares with Gold Rings, with rich stones on his fingers, being a white man and of very good understanding demanding of us the question the Noblemen before did, and wee answering him as wee did before, because that our speeches should be found always as one: wee gave him at that time a fine (*sic*) for a Present, to the intent that he might speake and write to the King his brother in our behalfe, that wee might have accesse unto the King the sooner, that our business might haue effect. The eight of Nouember

24. The 'w' is often omitted in contemporary spelling of his name.

25. Purchas V (1626 Ed.) p. 972.

26. I have been unable to discover any trace of these letters in the East India Company's Records. They are, however, referred to in the letter written by Thomas Jones at Masulipatam to George Ball at Bantam already referred to on p. 13, n. 17. "Mr. D'nton," he writes, "can best advise you in all particulars touching this business. whoe hath their letters received in January and March past along with him, which yf you please to peruse, you may perceave littell hope of recovery either of the former (Samuel's goods) or that caried with them more than their persons, which I wish weare heere."

27. Probably an emissary from the "King" of Golconda.

28. Riverine war-boats of the galley type, usually decorated with elaborate carving and gilding, especially at the prow. Burma had no navy capable of use at sea such as was possessed by Arakan in the 17th century.

29. Punctuation requires a full-stop here, but I have retained the original punctuation and spelling throughout.

30. Bamboo.

the King sent for us, and the King's Brother provided us with a boate, with six men to rowe, and also a Nobleman with us to Pegu, to be our guard, having Narsacan and Hodges Ismael with us, unto which Nobleman wee gaue a present, for in this place heere is nothing to be done or spoken, or any business performed without Bribes, Gifts or Presents. Arriving in Pegu the eleuenth of Nouember, hauing our Present with us, Bany Bram³¹ sent his men unto us, writing our names as before time, they also bade us choose any ground where wee would for to build us a house, but at our own cost and charge as all other men's custome is.³² Our House being finished, straightt order was given that wee must not walk anywhere out of our house to speake with any man until the King had spoken with us, and our Present deliuered. The King sent us a Present of Victuals with two Nobleman with it, which was some grace to us, though it was not of much value, and our comfort is, that all men report that the King is uery well pleased at our comming into his Country. The seuen and twentieth of December, the King sent for our Present, and sent two Horses for us, and being come to a gate of the Towne, to stay for his comming, when hee came out, hee sent for us. What speech or conference he had with us, Narsarca can certifie you, but it was to no purpose, concerning our businesse, nor could wee get none to moue the King in our businesse, more than he demands. The next our letter was sent for, and interpreted by a Portugall to the King, but one that speakes Pegu. Wee had much trouble with him about the true understanding of it, being not written in Portugese. The next day we deliuered that present you sent to Bany Bram; who gaue us many faire speeches like to others, but wee haue found them all to no purpose. The Country is far from your worships expectation, for what men soeuer come into his Country, he holds them but as his slaues, neyther can any man goe out of his Country without his leaue, for hee hath watch both by Land and Water, and he of himself is a Tyrant, and cannot eat before he hath drawne blond from some of his people with death or otherwise. For the businesse of Thomas Samuel and the Mallayor,³³ they had a falling out some 12 monthes before he dyed, and he tooke all the Companies goods into his hands, and the Mallayor had Narsarcans³⁴ in his hands, and comming to Pegu he fell sicke by the way, and dyed a short time after he came to Pegu,³⁵ but before his death the Mallayor was called for to giue

31. Binnya Byan, a Talaing title. Binnya-lord.

32. *Vide* Caesar Fredericke in Purchas II (1625 ed.) p. 1717 "All Merchants that meane to goe thorow the Indies, must carrie all manner of houshold stuffe with them which is necessary for a house, because that there is not any lodging, nor Innes, nor Hosts, nor Chamber roome in that Countrie, but the first thing a man doth when hee commeth, to any Citie is to hyre a house, either by the yeere, or by the moneth or as he meanes to stay in those parts. In Pegu their order is to hire their houses for sixe moneths."

33. Apparently a Malay who had accompanied Samuel from Chiengmai to Pegu.

34. i. e. Narsarca's goods. What exactly was his connexion with the episode is not clear.

35. Samuel.

THE EPISODE OF THOMAS SAMUEL.

account what men were indebted to Samuel, and the Pegues³⁶ and Bermanes that were indebted payd it all to the King, but the Moores that were indebted said, when the English came they would pay them, we went with others to Nichesa³⁷ and requested him to moue the King in our behalfe for our despatch, who returned answer : came we to demand our goods, and the English had neuer come to trade in his Country ? when our Ships came hee would giue all the goods, and what the English could demand to giue them content.

In another Letter the first of March,³⁸ wee had word sent us, the King would not let us go untill some English Ships came to Pegu. For the money wee brought with us, it is all spent, and wee are here in a most miserable estate, and knowe no way to help ourselues. For the King hath neyther giuen us any of our goods, nor leaue to recover none of our debts, nor taken our Cloth, but wee are like lost sheep, and still in feare of being brought to the slaughter. Therefore we beseech you and the rest of our Countrymen and Friends to pittie our poore distressed estate, and not to let us be left in a Heathen Country, slaves to a tyrannous King. Though the King gaue us nothing, yet had hee but giuen us leaue to come away, wee could haue certified your Worship of meanes to helpe to haue recouered all the mony and goods we came for. Lead³⁹ and Tinne heere is none to be sold, but if we receiue any money, wee do meane one of us to goe into the country to buy some, if any profit may be made of it. The Coast of Pegu is cleere and water enough on the Bar for any Ship : and for Pilots, there be many to be had in Musulipatam, that know the Coast very well. Wee intreat you for God's sake to be mindfull of us, and to pittie the poore estate wee are here in, and send some Ship to release us, and wee shall be bound to pray for your Worships good health and prosperitie."

So Forrest and Staveley found themselves virtually prisoners in Pegu, able to move about with freedom so long as they made no attempt to leave the country. Methwold goes on to relate that they "found good sale for their cloth" but soon "had consumed their Capitall, and taken up besides what their credit could supply, for which they could giue no other account, but that most was lost at play, and the rest profusely spent, whereof the Right Worshipfull East India Company are most sensible, and my selfe at that time in that place had some reason to be acquainted withall." At the end of 1619 Methwold wrote home to the Company that in the absence of letters from the two envoys he had gleaned his information of them from passengers arriving in Masulipatam from Pegu.

36. Talaings as distinct from Burmans.

37. Probably the Portuguese interpreter.

38. 1618.

39. Probably 'gansa' is here meant,

They were reported, he said, in April of that year to have had their house burnt down, and were about to leave the country, when the discovery of an important plot against the king's life caused so much disturbance that they dared not ask for the necessary permission to depart. In this way they had lost their chance of crossing the Bay of Bengal before the wet monsoon set in, and the homeward sailing season to the Coromandel Coast ended.⁴⁰ This letter of Methwold's was dated December 7th, 1619, so that it is evident that up to the time of writing Forrest and Staveley had not put in an appearance at Masulipatam. Yet in his 'Relations of the Kingdome of Golconda' in Purchas he states that they arrived back in April 1619. This must be an error, due in all probability to a slip of his memory. In the extremely defective records of the Company at this time there is no reference to the exact date of these two men's return to Masulipatam. We may, however, assume with a fair degree of probability that Methwold was exactly a year out in his computation, and should have given the date as April 1620 in his paper in Purchas. Native trading vessels were accustomed to leave the Golconda Coast for Syriam at the end of the rainy season (*i.e.* in September or October) and to start on their homeward voyage shortly before the commencement of the next wet monsoon (*i.e.* in February or March). Concerning this point Methwold gives the following interesting information in his "Relations": "In September the Ships⁴¹ for Achyne, Arrecan, Pegu, and Tannassery set all sayle, for it is to be understood that amongst this and all other Coasts of India, the windes blow constantly trade sixe moneths one way, and sixe moneths another; which they call the Monsons alternately succeeding each other, not missing to alter in Aprill and October, onely variable towards their end, so that taking the last of a monsoon, they set sayles, and with a forewinde arriue at their desired hauen, and there negotiating their affaires, they set sayle from thence in February or March following, and with the like fauourable gale returne in Aprille unto their owne Ports."⁴² This practice continued throughout the seventeenth century and well on into the eighteenth, English ships conforming to it when they began to make regular voyages between Fort St. George and Syriam towards the end of the seventeenth century.⁴³ As the two factors missed their chance of leaving Burma before the wet monsoon of 1619 broke, the odds are that they returned to Masulipatam with the returning Golconda boats in the following year.

In the end Anaukpetlun restored to Forrest and Staveley the property of the Company which they had come to retrieve. He would not actually hand it over, however, until the two factors were on the point of

40. Foster: English Factories, 1618—21, p. 154.

41. *i.e.* of Golconda. Purchas V (1626 ed.) p. 1004.

42. *Vide* also Caesar Fredericke in Purchas II (1625 ed) pp. 1716—17, where he mentions that ships from St. Thome bound for Pegu usually departed from the former place on the 11th or 12th of September; but he gives no information as to the time of the return journey. The subject receives further treatment in Chapter V.

43. Fort St. George Diary and Consultation Books, *passim*, for list of outgoing and incoming boats with dates of departures and arrivals.

THE EPISODE OF THOMAS SAMUEL.

embarking for Masulipatam "lest their ryot should haue consumed all", grimly remarks Methwold.⁴⁴ From Methwold's 'Relations' it would seem that in the end the king ordered the two factors to leave the country somewhat against their will. They were naturally no little perturbed at the reception they would get on their return after such an inglorious adventure, while the king was anxious to get into touch with the Company in order to establish direct trading relations. In his general letter home to the Company dated the 15th November 1620 Methwold describes the close of the affair.⁴⁵ The original letter is no longer in existence, but the abstract of it that is to be found in the Factory Records Miscellaneous⁴⁶ is worth quoting verbatim.

"The factors which were sent to Pegu to recover what was there remayning, have spent all that was sent both first and last. They have framed and exhib[it]ed a formlesse and false accompt, which he hath now sent home. Forrest, one of these Pegu factors, makes himself indebted for the rest, for so much lost at dice. The[y] spent all and yet took up 100 rials per exchange, which must be paid; for 60 rials whereof he⁴⁷ had a pawne, which they saie belonged to Mr. Denton. Theis Pegu factors were fownde to be roytous, vitious and unfaithfull; some of their own papeers doe evince them, which with their persons are sent to Jaquatra⁴⁸. Their accompts were forged at sea, and all their original papers they did cast overboard, least coming to light they might have disclosed all their untruthes. Forrest attempted to flec twice but was fetcht againe; a vearie villane, debauched, most audacious and dishonest. I forbear to send the accompt of his expence etc., because he is more worthy to be punished than able to satisfy. The retourne of all the Pegu adventure, first and last, is about 857 rials. The first adventure⁴⁹ was made by the seventh viage, but tourned over to the first joint stocke. The second adventure⁵⁰ was made by the second joint stocke. To pay both there is no more but 857 rials, which he will imploye in diamondes and bring with him."

According to Methwold's account in Purchas, Anaukpetlun followed up his remarks to the two factors regarding the desirability of the Company sending trading ships to Syriam, by forwarding along with them to the factors at Masulipatam a letter "written on a Palmito Leafe, signifying his desire to give free Trade and entertainment to the English Nation, if they would with their shipping repaire unto his Country." This was accompanied by a present of "a Ring set with a Ruby, two Mats, two Betele Boxes, and two narrow pieces of Damaske,

44. In Purchas V (1626 ed.) p. 1003.

45. Foster: English Factories 1518--21, p. 203.

46. Vol. I p. 55.

47. Methwold.

48. Bantam.

49. Samuel's.

50. Goods sent with Forrest and Staveley.

all worth twenty Nobles or thereabouts."⁵¹ Methwold does not seem to have jumped at the Burman offer. He wrote home to the Company that he thought it "not impertinent to send a small ship to some of the King of Pegues portes, being that King(s) speciall desire."⁵² With the "retornes from Pegu" he bought diamonds to the value of 534 pagodas⁵³ and some gum-lac, which were laden on board the *Charles* in December 1621 and forwarded to England.⁵⁴

Of Forrest and Staveley I can find no further mention in the records of the East India Company. This is not surprising, since many of the records of this period have been lost. Probably they were sent home in disgrace. It is noteworthy that in his "Relations" Methwold gives no mention of their names, "leaving them namelesse according to the obscurity of their qualities, and irregularity of their proceedings," he writes. From this fact we may possibly infer that they were alive and in England at the time of the publication of his paper. He would not wish to figure in a libel action.

Contrary to the view expressed by certain writers, Anaukpetlun's invitation to the Company to send trading ships to his country did not result in any immediate growth of direct trading relations between the Company and Burma, still less in the establishment of factories at such places as Syriam, Prome, Ava and Bhamo although an oft-quoted passage in Dalrymple's *Oriental Repertory* has been taken to imply as much.⁵⁵ No English factory was established in Burma until the year 1647 when the Company's first settlement was made at Syriam.

For an explanation of the Company's failure to establish a factory in Burma at this date the general condition of its affairs during the years 1619—1623 must be examined. After the incorporation of the Dutch East India Company in 1602 chronic hostility had developed in the East between the English and Dutch merchants. Hostile acts, committed in the first instance by the Dutch, led to reprisals and counter-reprisals, until at length an intolerable condition of affairs grew up in the Spice Islands. Officially the two nations were at peace with each other. They had behind them long traditions of past friendship and mutual aid. In order therefore to bring to an end this unfortunate rivalry commissioners of the two companies met in London at Merchant Tailors' Hall on January 16th, 1619, to discuss articles of peace and the conclusion of a Treaty of Defence.⁵⁶ In July of that year a Treaty of Defence was concluded which gave to the English a right to a share in the East Indian trade and to the shelter of Dutch fortresses. In return for these guarantees the

51. Purchas V (1626 ed.), p. 1007.

52. Foster: *English Factories 1618—21*, p. 209.

53. *Ibid.*, p. 255.

54. *Ibid.*, p. 343.

55. *Vide* Note II at the end of the present chapter on the alleged existence of English Factories in Burma before 1647.

56. *Factory Records Java 2, Part I, 1618—25.*

THE EPISODE OF THOMAS SAMUEL,

English Company was to contribute one-third of the Dutch fort and garrison charges in the Moluccas, Bandas and at Amboyna, one-half of those at Pulicat, and to maintain a fleet of ten ships to carry on raids upon Portuguese and Spanish trade and shipping in the East.⁵⁷

Under the terms of the treaty the Dutch promised to make restitution of all damage inflicted by them upon the English. When, however, they were pressed to settle the claims made against them by the Company, they delayed matters interminably by putting up counter-claims, and it was soon evident that their intention was to avoid completely the payment of any compensation whatever. This matter, in fact, dragged on until the days of Cromwell, and was only settled by the Treaty of Westminster at the end of the First Dutch War.

In the meantime the English factories in the Spice Islands found that the financial obligations imposed upon them by the Treaty could not be borne without help from home. But such help was not forthcoming for two reasons. In the first place the directors of the English Company thought that the money about to be realised by way of compensation from the Dutch would be ample for the needs of these factories. In the second place the Company was at this time anxious to develop trade between the west coast of India and Persia and was devoting all its available capital to promoting this enterprise. The Batavia Presidency and its subordinate agencies, therefore, were starved of capital and forced to abandon many of their trading ventures. In so precarious a state were their affairs at the beginning of 1623 that in January of that year the President and Council at Batavia resolved to abandon the factories in the Moluccas, the Bandas, and at Amboyna. The shocking "massacre of Amboyna" perpetrated by the Dutch in the following month merely served to strengthen a decision already arrived at for other reasons, and by the end of the year the factories at Patani, Pulicat, Siam and Hirado (in Japan) were closed. Only Masulipatam, Achin, Jambi, Japara and Macassar remained in the Batavia Presidency.⁵⁸ Under such conditions it was financially impossible for a factory to have been opened in Burma at this date.

As a result of the visit of Forrest and Staveley the Masulipatam factors apparently lost all interest in Burma. Thereafter they opposed all suggestions for reopening direct trade with a land in which the foreign merchant upon his arrival found himself hampered by all sorts of royal restrictions. The fear of Dutch hostility was also instrumental in keeping the English away from Burma. The Dutch had a trading post there from about 1627 to 1679.⁵⁹ In 1639 when the Masulipatam factors received order from the Company to make trial of the Pegu trade by

57. Foster : *English Factories in India, 1622—3*, Introd. p. XXXV.

58. Methwold, *op. cit. supra*, (in Purchas His Pilgrimage Vol. V (1626) p. 994) refers to the disastrous effect of the Treaty of 1619 upon English trade in the Far East.

59. *Vide* Harvey, *op. cit.* pp. 205, 349.

sending a ship there, they replied that such a proceeding would be equivalent to sending the ship "into the Lyons claws, we meane with (*sic*) our competitor the Dutch."⁶⁰ When eight years later it was decided to open a factory in Burma it is not surprising to find that this decision was strongly opposed by the Masulipatam factory.

Note I—Coinage and Currency.

The gold pagoda had been the standard coin of South India under the Empire of Vijayanagar. The origin of the word is obscure. [For full discussion of it see Hobson-Jobson s. v. Pagoda, Love: Vestiges of Old Madras, I, p. 192.] After the fall of Vijayanagar at the battle of Talikot in 1564 its pagoda and subsidiary coins, the fanam and cash, still remained the standard currency in the Golconda kingdom and on the Coromandel Coast. This coinage was used by the East India Company's merchants in the first half of the 17th century. The Masulipatam pagoda was worth seven shillings and six pence sterling in Methwold's early days. "A Pagoda equall in weight and alloy to a Frenche Crowne, and worth there seuen shillings sixpence sterling," he writes of it in Purchas V (1626 ed.) p. 996. Later on in 1639, when the Company obtained the right to mint coins at Madras, its pagoda was considerably less in weight than the Masulipatam one, which henceforth was known as the "old pagoda" in contradistinction to the "new pagoda" of Madras. Love in his "Vestiges of Old Madras" (see particularly Vol. I. pp. 192-196) gives the ratio of value between the new pagoda and the old pagoda as 1 is to 1.39. Later in the 17th century Bowrey ("The countries round the Bay of Bengal" 1669-1688) gives the old pagoda as worth twelve shillings and the new pagoda as worth eight shillings.

The fanam (Tamil panam, "money") was also a gold coin, but with a considerable amount of alloy in its composition. It bore various values according to the locality in which it was minted. Love gives the following local values:—

In Golconda	the fanam was equal to	1/12 of the pagoda	
In Porto Novo	„ „	1/18	„
In Pulicat	„ „	1/24	„
In Madras	„ „	1/36	„

(See also Hobson—Jobson, v. s. Fanam)

The copper cash, a name probably derived from the Tamil *kasu* through the Portugese corruption *caixa*, was a minutely small coin of very low value, eighty of which went to the fanam.

60. Foster, English Factories, 1637-41, p. 144.

In Methwold's day the silver rupee had not yet been coined in South India, but large quantities of silver dollars, known as "pees of eight", "reels of eight", "pieces of 8/8," of "ryalls of eight" were imported. These are many instances of the East India Company's factors using this coin for purposes of calculation in the 17th century⁶¹. In 1621 Matthew Duke at Masulipatam writing home to the Company (O.C. No. 983) mentions the pagoda as worth "about 1½ riall of eight, Spanish money". The value of the rial at the time of Forrest and Staveley's embassy to Pegu was about four shillings and six pence sterling. (Foster : English Factories 1618-21, p. 158.) They, therefore, took with them to Pegu goods worth about £200 sterling. The total proceeds of the venture, including what was realised of Samuel's estate, amount to barely £193 sterling.

Note II On the alleged existence of English factories in Burma before 1647

Writers of Burmese history, who have had occasion to deal with the matter of the earliest contact between that country and the East India Company, have one and all asserted the existence of English factories there early in the 17th century. Sir George Scott is of opinion that as a result of Anauketlun's invitation to the Company, factories were established at Syriam, Ava and Bhamo in 1619. He proceeds further to say that "these establishments remained in the country, with occasionally a somewhat hectic life."⁶² Sir Arthur Phayre⁶³ thinks that English factories were probably in existence at these places as early as 1612. He does not specifically connect their foundation with the episode of Thomas Samuel, though he mentions a part of the story. Messrs. J. S. Furnivall and W.S. Morrison, the compilers of the Burma Gazetteer, Syriam District, state in one part of their volume⁶⁴ that an agency of the East India Company was founded at Syriam in 1612, while further on⁶⁵ they give the date of the foundation of the English factory there as 1639. The most recent writer on the subject, Mr. G. E. Harvey⁶⁶ says: "From about 1627 onwards both the English and Dutch East India Companies had branches in Burma under junior representatives. These branches were closed from time to time, and although profits were occasionally considerable, steady trade was impossible because of the disturbed state of the country. The English were at Syriam, Ava and Bhamo, the Dutch at Syriam, Pegu and Ava."

61. On this point *vide* Foster, John Company, Chapter III, wherein he gives an interesting account of the East India Company's early experiment in coining those dollars.

62. Sir George Scott : Burma from the Earliest Times to the Present Day, p. 13

63. History of Burma, p. 273.

64. Furnivall J. S. and Morrison W. S., Burma Gazetteer, Syriam District, Vol. A. (Rangoon 1914) pp. 28-9.

65. *Ibid*, p. 192.

66. A History of Burma (1925) p. 191.

The number of conflicting details contained in these accounts serves mainly to show in what obscurity the subject is wrapped. It would seem that the chief evidence relied on by these writers is to be found in two vaguely worded passages in Dalrymple's *Oriental Repertory*.⁶⁷ The first occurs in Dalrymple's notes written in 1759 on the subject of the expedition to settle the island of Negrais in the year 1753. The passage runs thus : " It may afford you some entertainment to receive a brief Account of several attempts, made, in ancient times, towards an *Establishment* in this *Country*, so far as I have been able to meet with any Records. This Account must necessarily be obscure, from want of complete memoirs. . . . In the beginning of the 17th century, it appears, both the *English* and *Dutch*, had considerable Commerce in the *Buraghmah Dominions* ; the *English* had *Establishments* at *Syriam*, at *Prom*, at *Ava* ; and on the *borders*, of *China* ; probably at *Prammoo*. . . . On some dispute with the *Buraghmah Government*, the *Dutch* threatened (if they did not even attempt) to bring in the *Chinese* ; this very justly gave umbrage to the *Buraghmah*, who immediately turned both *English* and *Dutch* out of his *Dominions* ; many years elapsed before the *English* could obtain leave to return ; and the *Dutch* never were re-admitted."

The second passage occurs in a letter of instruction given by Nathaniel Higginson, Governor of Fort St. George, to Edward Fleetwood and James Lesly on the occasion of their mission to Ava in 1695. It runs : " The Right Honourable Company had Factorys at *Syriam* and *Ava*, in former years, but withdrew them ; the *Trade* proving *unprofitable* ; the terms and privileges of the Trade then enjoyed, does not appear in any writing, because the *King* never gave any *Phirmaund*, or *Articles* in writing."

Dalrymple gives neither dates nor references in support or explanation of these statements, but it is noteworthy that he does not mention the story of Thomas Samuel, and makes no statement that can be construed into meaning that the earliest English factories in Burma were established by invitation of the king. The records of the East India Company surviving from this period are undoubtedly defective, but had English factories existed in Burma previous to the foundation of the Syriam factory in 1647, the temporary records must have contained some reference to them. Previous to the erection of Fort St. George into a presidency in the year 1652 the Company's stations around the Bay of Bengal and on the Coromandel Coast were subordinate to the chief factory in Java (either Jakatra or Bantam). The Java papers of the period previous to 1647, whether in the Factory Records series or in the Original Correspondence, contain no reference whatever to English factories in Burma, and, in fact, hardly a single reference to Burma. In addition

67. Vol. I, p. 98, vol. II, p. 345.

THE EPISODE OF THOMAS SAMUEL.

to this it is significant that in the papers relating to the foundation of the factory at Syriam in 1647, no mention is made of previous, or already-existing English settlements in the country.

Finally it should be borne in mind that William Methwold, who received Anaukpetlun's offer, did not advise the founding of a factory in Burma. Neither in his letters home from Masulipatam nor in his "Relations of the Kingdome of Golchonda" is there any mention of such a possible development. Samuel, when a prisoner in Pegu, was allowed to carry on trade. Forrest and Staveley, on their mission to Pegu for the restoration of Samuel's goods, took out piece-goods with them at the Company's charge and traded with them, as has been related, during their stay in the country. But these haphazard operations were in no way connected with the foundation of factories. Possibly it is these proceedings that have misled writers into thinking that factories existed in Burma at so early a date. But it is difficult to understand how anyone could imagine that English factories were founded in Burma as early as the year 1612, when de Brito was still in possession of Syriam!

CHAPTER III.

The Foundation of the Syriam Factory and its early prosperity (1647-1652).

There seems to have been little direct trading between the East India Company and Burma previous to the establishment of the factory at Syriam in 1647. On account of the piratical operations of the scallywag horde of *feringi* mercenaries in the pay of Arakan, voyages in the neighbourhood of that coast were attended by no little peril. In 1630, therefore, we find the Masulipatam factors recommending that the Armagon factory should be supplied with a small armed vessel of 80 to 100 tons burthen for coasting voyages to such places as Arakan and Pegu.¹ Four years later the Masulipatam factors asked for two similar vessels for their own use, and mentioned in support of their request that the Dutch favoured this type of ship because of its adaptability for either trade or fighting. "And now both their and our small vessells will be more usefull than ever" they wrote, "for there's noe thought of trade into the Bay without them, our greater ships ridinge so farre from the shoare, and the Kinge of Arrackans jelliaes (or small boats of warre) ever scoutinge betwixt them and the land, insomuch as neither goods nor provisions can be brought of without pinnaces of some defence, such as we have nam'd, which may goe up the rivers for the same without feare and transport it to the bigger vessells." ²

Occasionally a Company's agent on the Coromandel Coast received half-hearted instructions to inquire into the possibilities of trade with Pegu,³ but in each case opinion appears to have been against such ventures. The few English traders who visited Burma during this period were either interlopers or sea-faring men in the employment of Indian merchants. Some of the Company's servants stationed on the western coast of the Bay of Bengal carried on clandestine trade with the land of pagodas; notorious among these was a certain Henry Sill, who, when attached to the factory at Armagon, carried on an extensive business in exporting Coromandel cloth to Pegu, Arakan and Tenasserim through the Company's native agents at Armagon.⁴

It has already been shown that one of the chief reasons for the East India Company's neglect to follow up its first venture to Pegu was that, on account of the development of its Persian enterprises and the financial strain imposed upon it by the terms of the Anglo-Dutch Treaty of Defence of 1619, the Batavia Presidency and its subordinate agencies were starved of capital and forced considerably to curtail their activities. In 1646 a

1. Foster; *op. cit.* 1630-33, p. 86; C. S. P. C. E. I. 1630-34, p. 75.

2. *Ibid.*, 1634-36, p. 43.

3. *Ibid.*, 1630-33, p. 301, and 1637-41, p. 144.

4. O. C. Nos. 1375, 1486, 1487, and Foster, *op. cit.*, 1630-33, *passim*.

THE SYRIAM FACTORY (1647—1652).

variety of circumstances, among which local disturbances and Dutch competition were potent factors, brought the Persian trade to a somewhat abrupt standstill.⁵ From Mokha, Basra and Gombroon alike came reports of bad markets. The Surat council therefore began once more to consider the possibility of opening out fresh markets on the eastern side of the Indian Ocean, and decided "to seeke out new employment for its shipping in more remote parts, as Pegou and Johore."⁶

The success of private trading voyages made to Burma by ships fitted out by individual members of the Company,⁷ and the reports of the prosperous state of the Dutch trade in that quarter, whetted the appetite of those responsible for directing the Company's affairs in India for a venture to a land so famous for its rubies and lac.⁸ In fact although the Surat council reported home in 1648 that the opening of trade with Pegu was the result of the failure of the Persian markets, we find them as early as January 1645 asking for more ships in order that they might send some of their smaller vessels to the Coromandal Coast for employment "to the Bay, Pegoo, Denaceree⁹ and other places, from whence, were those trades experimented, might be competant gaines¹⁰". This point is all the more interesting because the historian Bruce attributed the cause of the Company's earliest trading voyages to Pegu to the war between Visiapore and Golcondah in 1648-49, which wrought terrible destruction to the districts around Madras and Masulipatam.¹¹

The decision on the part of Surat to extend the scope of the trading operations of the Company was remarkable in view of the pessimism prevailing at that time among the directors at home. For over ten years the East India Company had been fighting an uphill fight against a series of attempts made with the active connivance of Charles I's government, to abolish its monopoly in the East. The association of merchants, which under the leadership of Sir William Courten and Sir Paul Pindar had obtained licence from Charles I in 1635 to participate in the East Indian Trade, threatened the very existence of the East India Company. To make matters worse the Long Parliament disliked the Company because of its loyalty to the king and its creation by royal prerogative, and refused to give it any support against Courten's association until it had re-incorporated itself upon a parliamentary basis. When after much bribery the Commons in 1646 had passed a bill, which effected the necessary re-incorporation and gave Courten and his associates three years in which to withdraw completely from the East Indian Trade, the House of Lords rejected it in March 1647, and the Company unable to raise a

5. Foster, *op. cit.* 1646-50. Introd. p. viii.

6. *Ibid.*, 1646-50, p. 184.

7. *Ibid.*, 1642-45, p. 76.

8. *Ibid.*, 1646-50, pp. 89, 98.

9. Tenasserim.

10. Foster, *op. cit.* 1642-45, p. 229.

11. Annals of the Honourable East India Company, p. 454.

fresh stock of capital, ordered its presidents at Surat and Bantam to cut down their staffs and prepare to wind up its affairs in the East. Yet in the teeth of these instructions we find the Surat council optimistically exploring new openings for trade, confident in the ultimate success of its undertakings.¹²

At the outset the Pegu venture was beset by great difficulties. The Masulipatam factors were strongly opposed to it,¹³ and only the loyal co-operation of Fort St. George made it possible to carry the new scheme through. Capital to finance the undertaking was lamentably short, but the Company's chief creditor, Virji Vora, was persuaded to refrain from pressing for the repayment of the money (amounting to 20,000 rials) that the Surat presidency had on loan from him.¹⁴ This accomodating financier also went so far as to finance the Pegu undertaking to the extent of 10,000 old pagodas carrying interest at the rate of $1\frac{1}{16}$ per cent. per month.¹⁵

During the winter of 1646-7 a serious famine broke out in the Madras neighbourhood and the Fort St. George factors found themselves in such straits that they were obliged to seek help from Masulipatam. When this was not forthcoming, we find them in January 1647 writing to Surat for "100 or two tunns ordinary rice to preserve the lives of those few painters, weavers and washers who remain about us; by which meanes wee shall bee the better able to comply with yow in the Pegu investment".¹⁶ They also complained that the civil wars by which the country was then distracted, and the famine, made it difficult to get piece-goods with which to make up the cargo for Pegu.¹⁷

The factors at Fort St. George hoped to despatch their first shipload of goods to Pegu before the wet monsoon of 1647 set in. But by the middle of May—when the first signs of the great change of weather were expected—no ship had turned up from Surat, and the factors were more than a little exercised in their minds at the delay, which not only hindered their plans, but made it impossible to borrow money locally for the investment.¹⁸ Apparently the Indian brokers would not venture their money until the ship itself materialised. The non-arrival of a ship was due to the fact that the *Lammeret*, which Surat originally intended to send to Fort St. George, was sent instead to Suakin, where the Company had recently opened a factory.¹⁹ In her place it was decided to send the *Endeavour* on her return from Gombroon.²⁰

12. Foster *op cit.* 1646-50, p. 191.

13. *Ibid.* 1646-50, p. 191.

14. *Ibid.* 1646-50, p. 89.

15. *Ibid.* 1646-50, p. 308.

20. *Ibid.* 1646-50, pp. 89, 106.

16. *Ibid.* 1646-50, p. 74.

17. *Ibid.* 1646-50, p. 71.

18. *Ibid.* 1646-50, p. 129.

19. In 1646.

In 1644 her captain wrote of her as "the bravest Ship of her Burthen as ever came to Surratt, for shee sayleth better then any Dutch ship that ever wee mett, which doth anger them much, and workes very well." (O.C. 1876 quoted by Love, *Vestiges* I, p. 61, note 4.) She was sunk by the Dutch in a fight off Gombroon in 1653, Foster, *op. cit.* 1651-54, pp. 249-253.

After a short detention at Swally for repairs, the *Endeavour* set sail in April for Fort St. George²¹. On her sailed Thomas Breton, who was to take charge of the new factory in Pegu. She also carried a supply of rice and wheat for the relief of the famine-stricken garrison²². She arrived at Fort St. George on May 22nd.²³ In their letter to Surat dated May 10th, the factors had pointed out that owing to the monsoon no vessel could be despatched across the Bay to Pegu until August at least. This probably explains why she was not at once freighted for Pegu. In the meantime the Fort St. George factors had other more immediately profitable employment for this vessel. After landing her chief passenger and her cargo of rice and wheat, the *Endeavour* was at once sent up the coast to lade more rice for relieving the famine around Madras.²⁴ It was estimated by the factors that they could dispose of their surplus rice at 100 per cent. profit.²⁵ On her return to Fort St. George after discharging her cargo, she was partly freighted for Pegu and then despatched to Masulipatam to complete her lading. From thence she was expected to sail for Pegu in August. Actually however, she put out from Masulipatam on September 15th with a cargo of goods valued at 20,836 rials of eight²⁶.

The factors sent to Syriam on the *Endeavour* to open the first English factory in Burma were Thomas Breton, chief factor, Richard Potter and Richard Knipe. Of these Potter alone had previously been in Burma, having made a private trading voyage thither together with Richard Cogan, a son—probably illegitimate—of Sir Andrew Cogan, one of the original founders of Fort St. George.²⁷ Richard Cogan, who was invited to accompany the Syriam expedition, refused to go, preferring instead to fit out a vessel on behalf of the Nawab Mir Jumla designed for the same destination. For this he was arrested and put in irons ready to be sent home to England. Mir Jumla, however, secured his release, and he fled to San Thomé where he “turn’d Papist rouge.”²⁸

In their first letter to Madras written on January 1st 1648, the prospecting factors reported that they sighted land on October 3rd.²⁹ This was probably the golden pagoda on Cape Negrais, which used to be such a landmark for sailors in the days of empirical navigation. Contrary currents, however, prevented them from making Syriam until October 23rd. The prospect in Burma on their arrival was not exactly an inviting one. In 1635 King Thalun had moved his capital from Pegu

21. Foster, *op. cit.* 1646-50, p. 126.

22. Bruce, *Annals*, I. p. 424.

23. Foster, *op. cit.* 1646-50 p. 134.

24. *Ibid.*, 1646-50, pp. 134-5, 139, 164.

25. *Ibid.*, 1646-50, pp. 74, 135.

26. *Ibid.*, 1646-50, pp. 135, 139, 163, 165.

27. Love, *Vestiges*, I. p. 58, Note 2.

28. Foster, *op. cit.* 1646-50, p. 198 and 1651-54, p. 260.

29. *Ibid.*, 1646-50, p. 177.

to Ava, which in those days was a two months' journey by boat from Syriam. When the East India Company's factors arrived in Syriam, they found that without royal permission they could not even relade their ship for a return voyage to the Coast. To secure this they must go in person to Ava. To make matters worse Thalun's son Shintalok had raised what at first seemed to be a serious rebellion against his father. News of this greeted the factors on their arrival at Syriam. Shortly afterwards, however, the rebellion collapsed and Shintalok was slain. Not until definite news of this reached Syriam did the factors deem it sufficiently safe to make the tedious journey to Ava.

"Wee found," they continued in their letter to Fort St. George, the country standing distractedly amazed at the civill warr that then was in Ava (the metropolis of this kingdome) betweene the King and his eldest sonn. not knowing which party to take, till it pleased God to give victory to the King by the slauter of his said sonn, who had determind his death ; which was not believed in Sirian till the middle of December, when there begun to be againe corispondence between it and Ava, reviving these merchants in their bussines and animating us to proceed in the sayle of our goods."³⁰

They went on to say that their profits on actual sales were good but offset by the high customs duties, "which will amount to neare 16½ per cent., and that required in spetia, with more strictnes then wee have ever seene in any other place." Another difficulty arose out of the fact that the agents, through whom they had to do their selling,³¹ refused to do business unless they entrusted their goods to them for not less than seven months, while a further hole would be made in their profits, they said, by "the exceeding charge which will come upon the ship by her resideing here soe long time as till wee have dispatched our bussines."

They had hoped, they continued, to send the *Endeavour* back to the Coast with a cargo of rice, but even if they had not been prevented from so doing by the necessity of securing royal permission for her departure, the condition of her crew would have rendered such a proceeding too hazardous. Her captain, Robert Cherry, her chief mate, Isaac Birkdale, her surgeon and three of the best seamen had died since leaving Masulipatam, and there was much sickness among the crew, occasioned by the "very unhealthful" climate of the country. The *Endeavour* was in dry dock, "to keepe her from the wormes and repaire her sheating, and that at more charge then thought of in this reported (but not truely) cheape country." They requested therefore that Rickman, a former chief mate of the ship, should be sent out to take charge of her, accompanied by as many seamen as Fort St. George could spare.

30. *Ibid.*, 1646-50, p. 177.

31. *Vide* Hobson-Jobson, s. v. Tarega.

The letter closed in a more optimistic mood regarding the prospects of trade. They were, they said, "not in dispaire (if the country remaine quiett) to make the voyage worth the charge of its tryall, but—they proceeded—this cannot be proved, till you see what wee shall be able to bring you in returne, neither till then can you know, whether the trade be worth the continuance, nor till our better experience of this country shall enable us to informe you, how to follow it with least expence and most advantage."³² They themselves were about to set out for Ava, having been summoned thither by royal command. As the journey itself would not take less than two months, they estimated that they would be away from Syriam for at least a year. Richard Knipe, therefore, was to be left behind in charge of the factory to collect debts due to them on sales of goods and "keepe account of the ships expence." In view of the fact that their long stay would exhaust their provisions, they requested that such stores as were unprocurable locally, and especially butter, should be sent to them by Dutch conveyance, "and if you please to acquaint us with the tast of Sack and Beare it will be very proper for this unhealthfull place."³³

On the journey to Ava, which was begun soon after this letter was written, a fresh disaster awaited the unfortunate factors. It shall be described in their own words. On March 27th, 1648, the Fort St. George factors received by a Dutch ship the following letter³⁴ from Breton and Potter dated February 11th, 1648 "20 dayes journey short of Ava:" "When we took our leaves of you at Sirian," they wrote, "wee were sent for by the king in such hast that we have not since had opportunity againe to wright to you, and now greive at this unfortunate occasion. You have already heard how the hand of the Almighty hath been upon us in takeing from us many of our ships company before wee came to Sirian; nor hath it there staid, but came again upon us in a most deplorable disasture which happened with us yesterday in the morning, when about four of the clock one of the Pegue boatemmen, in dressing victualls for his company, sett fire on the boat where wee was, and had laden for our hon'ble Comp'ie besides what hath escaped our memory, 59 halfe bales cotton Yarne all our Salempores³⁵ all our white Betteelaes³⁶ except what sold the king which is of both but 158 pieces all our Broad Cloth all our goods rec'd for ffreight all our household stufe and provisions which by the violence of the said fire were before day consumed to little better than nothing, nor doe wee know in this confusion, what more wee have lost then this; wee have soon utterly spoiled, nor will the hast of the boate by which this is sent to Sirian, give us leave to make further discovery in time to advise you thereof. Of what necessaries wee had of our owne wee are utterly stripped, even to our dayly weareing clothes, not haveing left us anything to lie upon in this wilderness save the bare

32. Foster, *op cit* 1646-50, pp. 177-8 gives a few verbatim quotations from this letter. I have, however, used the original document (O. C. No. 2058) for those given here.

33. In the postscript to the letter already quoted.

34. O. C. 2069 (part only of this is given verbatim in Foster, *op. cit.* 1646-50, pp. 200-201).

35. A kind of chintz. *Vide* Hobson-Jobson s. v. Salempoory.

36. A kind of muslin. *Vide* Hobson-Jobson s. v. Betteela, Beatele.

ground; nor have wee other remedy till wee repaire to the other boate, which conteyneth the remainder of our goods. The ruines of what wee have left, though of very little vallow, yet wee conceive them worth the carriage to Ava; but such is the cruelty of these people that, seeing us in necessity of a boat, will not be hired to furnish us for less then 500 usest;³⁷ which, though it sinck deep into the worth of our burnt goods, yet is better given then that they should be altogether lost.

The consideration of the premises hath almost killed our harts with greife, but in this wee finde noe remedie, and therefore must take courage to endeavour to bring what is left to better success, wherein it is impossible wee should be more carefull then wee have been already (though wee have been unfortunate) wee shall only desire your prayers for our future better fortune."

This was not the only disaster of the trip, for in a postscript to this letter they mentioned that on January 23rd Richard Manly, a sailor in charge of one of their boats, fell overboard and was drowned. Notwithstanding these disasters, however, Fort St. George was satisfied with the opening of the venture. It transpired from the list of sales which accompanied the letters from Syriam, that the proceeds were nearly three times the original cost of the goods³⁸ and the Fort St. George factors were of opinion that even the loss of one boatload of goods on the Irrawaddy by fire would not prevent a substantial profit accruing to the venture as a whole. They therefore wrote to Surat that they were glad the advice of the Masulipatam factors had not been listened to when the venture was first mooted. "The abstract of goods sold in Pegue", their letter continued, "and provided here by us in Madraspatam cannot surely chuse but give the Companie good incouragement for the prosecuteinge of the Pegue trade, and likewise to give the 1st actors thereof there due comendacons, notwithstanding the unhappie disaster of fire which befell our freinds in carrying up of their goods. For disasters are alwaies incident unto merchants . . . And for disasters," they piously averred later in the same passage, "wee must leave to the will of the Almighty who has the disposeure of all things."

It was decided at Fort St. George to send William Curtis, chief mate of the *Farewell* to take charge of the *Endeavour* and return her to Madras, since they were in great need of shipping³⁹. Curtis with two or three English sailors and a stock of provisions was to be sent out by a Dutch boat due to sail for Syriam in May 1648. We have no exact information as to the date when the *Endeavour* left Syriam. As late as the end of

37. A copyist's error for "viss", i. e. viss of gansa. See Foster, *op. cit.* 1646-50, p. 200 n.

38. Foster, *op. cit.* 1646-50, p. 201.

39. In 1648 the Fort St. George factors wrote home to the effect that if the trade to Pegu were to be kept open, two ships of 120 tons burthen must be sent out from England.

See also Bruce, *Annals*, I, p. 430.

January 1649 President Breton of Surat in his letter home mentioned her as being still at Pegu.⁴⁰ In the following April he wrote that she was expected back from Pegu at the time of writing, and was to return thither with another cargo that was then being prepared for her on the coast.⁴¹ The President and council at Bantam, however, ordered the Madras agency "by such positive comaunds as that Agent etc, pretends they durst not disobay" to send the *Endeavour* to Bantam, and much to the annoyance of Surat the Fort St. George factors complied.⁴² On August 6th therefore she was despatched from Madras upon a long and stormy voyage to Java in the course of which she lost many of her crew.⁴³

Our knowledge of the fortunes of the Company's servants in Burma at this time is sadly deficient. Very few of the letters written by the factors in Syriam and Ava have survived. After the one dated February 11th 1648, written by Breton and Potter on their way to Ava, the records of the East India Company contain no further letters written from Burma until October 1653. Our other source of information regarding affairs in Burma, the periodical official letters written by the Agent and Council at Fort St. George, is also non-existent for the years 1649 and 1650.⁴⁴ We may, however, make certain inferences. The factors apparently were well received in Ava, since the President and Council at Surat in their official letter, to the Company, dated January 25th, 1650, mentioned that they were sending home "a ruby set in a gold ring, the present of the King of Pegue,⁴⁵ which is put into the chist of books and papers".⁴⁶ No treaty or articles of trade were made between the Company and the Burmese monarch, but permission was granted to build a house and dock in Syriam, and certain abatements of customs duties and other privileges were granted in favour of the English merchants.⁴⁷

Notwithstanding the difficulties and disasters which attened it, the initial venture to Pegu was a success financially. In January 1650, Surat reported home that making allowances for all losses, the profits of the venture would amount to "upwards of 40 per cent., if all debts stand good⁴⁸". It is remarkable, however, that as late as 1650, the money borrowed from Virji Vora, four years earlier, for financing the venture had not been repaid, and the large sums that had to be paid to him by way of interest caused the Surat council no small qualms.⁴⁹ The chief cause

40. Foster, *op. cit.* 1646-50, p. 247.

41. *Ibid.* 1646-50, p. 250.

42. O. C. Duplicates 2147. Foster, *op. cit.* 1646-50, p. 273.

43. Foster, *op. cit.* 1646-50, p. 271.

44. Foster, *op. cit.* 1646-50, Introd. p. XXX.

45. It is uncertain which king is here meant. They arrived in Ava in 1648. In that year king Thalun died and was succeeded by Pindale (1648-61).

46. Foster, *op. cit.* 1646-50, p. 294. It was put up at a Genera. Court of Sales held on November 27th, 1650 and fetched £28.

47. Dalrymple, *op. cit.* II, p. 345.

48. Foster *op. cit.* 1646-50, p. 291.

49. *Ibid.* p. 308.

of the delay was that a sum of money⁵⁰ had been raised on the security of the cargo left behind in Burma by the *Endeavour*. Richard Knipe had been sent with this money to Bengal to make purchases on behalf of the Company. When late in 1649 the Fort St. George council sent the *Greyhound* to Balasore to receive the goods, Knipe and his goods were at Rajmahal the capital of Bengal, and the boat had to return without them⁵¹. Meanwhile the President and Council at Surat found the interest on its loans so heavy that in March 1650 they wrote home begging for money to be sent out to enable them to clear off their liabilities.⁵²

The Madras factors entertained high hopes of the success of the new trade connexion opened with Burma. To a certain extent their prognostications were justified. Certainly the reports we have of the trade to Burma previous to the opening of the first Anglo-Dutch war in 1652 are such as would have justified the prosecution of the enterprise. In October 1650 Surat reported home that the Pegu adventure was thriving. A second cargo of goods had been despatched to Syriam from Fort St. George in 1640 on board the *Dove*, which had returned to the coast in March of the following year with news of plentiful sales and great profits. She had brought back a cargo of gansa, rice and Martaban jars valued at a little over 5,159 rials. The president and council noted, however, that the weak spot in the trade to Burma lay in the returns (*i.e.*, the sales of goods exported from Burma) "which is allwayes rather loss then gaines, or otherwise the trade would bee the proffitabest of any you now have or (since that of Manelà)⁵³ have formerly prosecuted in many yeares."⁵⁴

So optimistic were the Coast factors as a result of the second venture to Pegu, that they decided to buy and fit out a vessel specially for voyages to Syriam. Two circumstances further encouraged them to take this step. In 1650 the political outlook in Burma was more promising than it had previously been for some years. Ever since the Ming dynasty had been overthrown in 1644 China had become the prey of freebooter armies which ravaged her outlying provinces and made periodic incursions into Burmese territory. Early in the reign of Pindale a Burmese army had been defeated by the Chinese at Wetwin, near the modern hill-station of Maymyo, and the invaders had laid waste the country almost up to Ava itself. In 1650, however, the Company's factors at Fort St. George received news that the Burmese had defeated "their plundering neighbours and that the country was like to be settled and in a peacefull condition."⁵⁵

50. "near 30,000 ma [hmudis]" (*Ibid*, p. 291). but another account (O. C. 2200) gives it as "neere 6000 rupees."

51. Foster, *op. cit.* 1646-50, p. 291.

52. *Ibid*, p. 380.

53. Manila.

54. Foster, *op. cit.*, 1646-50 pp. 317-8.

55. Foster, *op. cit.*, 1650-54, p. 19. Actually, however, this was but an interval in a chronic series of raids which went on for over twenty years until put a stop to by the Manchu dynasty

THE SYRIAM FACTORY (1647—1652).

The second circumstance, which rendered English trading prospects with Burma favourable was that in 1650 it was reported that "the Dutches investment was much damnified and the Nabobs utterly cast away,"⁵⁶ so that markets were considered likely to prove good for the English merchants. The Masulipatam factors were therefore instructed to buy a vessel of about two hundred tons burthen and fit her out with a crew of lascars and all necessary provisions. This was done at a cost of a little less than 1600 old pagodas. The new junk—for such she is called in the journal of Charles Wylde, purser of the *Bonito*⁵⁷—was named the *Ruby* after the famous product of Burma. She was armed with four guns provided by Fort St. George. In addition to her complement of lascars seven or eight English sailors were appointed to her, and Thomas Bland,⁵⁸ who had been twice previously to Burma as mate, became her master. On September 16th, 1650, she set sail for Syriam with a cargo valued at 3,845 rials. In addition she carried a little freight provided by native merchants trading on their own account, but the Fort factors complained that more freight of this sort would have been carried had not the Governor of Masulipatam forced all native merchants sending goods to Syriam to lade them on his own boat, that was about to sail for the same destination.⁵⁹ For three years the *Ruby* was employed in the Syriam trade. In 1653, however, she was sold to a Moorish trader for 800 old pagodas and her crew transferred to the *Bonito*.

On April 3rd, 1651, the *Ruby* returned to Fort St. George after her first voyage to Syriam, bringing with her a cargo valued at over 33,486 rials. A small portion of her cargo was landed at Madras; about an equal amount was sent up to the Bay factories in a Moorish junk under the care of William Jearsey, who had returned from Pegu on the *Ruby*; the ship herself was sent to Masulipatam, there to unload the major portion.⁶⁰ She brought also to Madras a present from the King of Burma to the Agent of Fort St. George, which caused Henry Greenhill⁶¹ and his Council to write home strongly hinting that in this case the Company might relax its rule forbidding its servants from taking presents from native rulers.⁶² "In the Pegu invoice," they wrote, "the Kings present to the Agent stands unrated, as what is usually appropriated by the Commander of other Nations, Dutch and Portugalls to their perticuler⁶³ which wee (haveing noe president⁶⁴ from our predecessors) may not doe without your licence, therefore have herewith in Mr. Woods custody sent

56. *Ibid.* 1650-54, p. 19. The 'nabob' was Meer Jumla who traded regularly with Burma.

57. *Ibid.* 1650-54, p. 6.

58. In 1655 he was imprisoned in Fort St. George for a scandalous conspiracy with his wife against Agent Henry Greenhill. *Vide* Love, Vestiges, I, pp. 156-160.

59. Foster, *op. cit.* 1650-54 p. 19.

60. O. C. 2246. Foster, *op. cit.* 1650-54, p. 97.

61. A full account of his career is to be found in Love, Vestiges, Vol. 1, *passim*.

62. A precis of this letter is to be found in Foster, *op. cit.* 1650-54, pp. 97-8. I have relied on O. C. 2246 for the verbatim extract that follows, as only a portion of it is given by Foster.

63. i. e. perquisite.

64. precedent.

a small Ivory Box, sealed up, containing a Ruby ring valued heere about £20 sterling, the other part or peece being a small Goulden Bull with more eyes then hee should have through the thinness of the mettles, for a Betel Box⁶⁵ valued aboute £30; which we retaine here yet unbroaken in honour of the sender, whose Majestie adors the beast and could not in point of state have done us a greater favour."

The same letter contains information of the numbers and names of the Company's servants in Burma. Three 'Pegu factors,' William Jearsey, Martin Bradgate and Thomas Howard, returned to the Coast on board the *Rully*, leaving three behind—Knipe, Francis Yardley and Samuel Archer, who in another document is classed as a surgeon.⁶⁶ Of the factors who sailed to Syriam on board the *Endeavour* in 1647, Thomas Breton, after his adventurous journey to Ava, must have returned to Fort St. George on the return voyage of that ship in the summer of 1649, since he left Madras for Surat on board the *Expedition* on October 3rd of that year.⁶⁷ He had no further connexion with Burma.

It is not a little surprising to find that Richard Potter, who had accompanied Thomas Breton to Ava, was given a gratuity of £100 for his good service in Burma.⁶⁸ In the first instance he it was, who by "unwillingness and false report" was mainly responsible for the opposition of the Masulipatam factors to the project of opening a factory in Burma; apparently he was only with great difficulty persuaded to accompany the venture.⁶⁹ How long he stayed in Burma we do not know. In January 1651 he was reported to be in the neighbourhood of Balasore.⁷⁰ In that year also we find him and Richard Knipe made responsible for the bad debts to the amount of Rs. 8,000 contracted by the first venture to Syriam.⁷¹ These, however, were all made good by them. The Madras records mention a house belonging to him in that city, where for some time he lived with his wife and daughter. He died in 1653.⁷²

Richard Knipe, after his journey to Bengal to buy goods with the money raised on the security of the stock left behind by the *Endeavour* in Burma, returned to Syriam as chief factor early in 1651. Agent Henry Greenhill in a letter from Fort St. George dated January 18th 1651 mentions him as having gone to Pegu,⁷³ but his name does not appear in the list of factors in Pegu dating from somewhere between January 18th

65. An integral part of the regalia of most Eastern potentates. *Vide* Hobson-Jobson, s. v. Betel

66. O. C. 2243. I have been unable to discover any information as to the date when any of these factors, except Knipe, went to Burma.

67. Foster, *op. cit.*, 15-16.50, p. 290.

68. *Ibid.*, 1651-54, p. 16.

69. O. C. 2074. Letter of Tho. Ivie and William Gurney at Fort St. George to the President and Council at Surat, dated March 28th, 1648.

70. Foster, *op. cit.*, 1651-54, p. 16.

71. *Ibid.*, 1651-54, p. 47.

72. Love, *Vestiges*, I, pp. 119 n. 3, 132, 141.

73. Foster, *op. cit.*, 1651-54, p. 21.

THE SYRIAM FACTORY (1647—1652).

and February 19th of that year.⁷⁴ As has been shown above, however, he arrived there before the departure of the *Ruby* in the following March. The list referred to gives the names of Martin Bradgate, William Jearsey, Samuel Archer, Thomas Howard, John Lawrence and Thomas Edwin as factors in Pegu at the beginning of the year 1651. Of these Jearsey and Howard left by the *Ruby* in March. Lawrence and Edwin are not mentioned in the list of factors left behind in Pegu. In fact we hear nothing more of them from this time onwards. The conjecture may be hazarded that the "very unhealthfull climate" was the cause of their sudden disappearance from the East India Company's records.

Our next list dated January 10th, 1652,⁷⁵ gives us Richard Knipe, Francis Yardley and Samuel Archer as in Pegu, and Martin Bradgate⁷⁶ and William Jearsey⁷⁷ as in the *Ruby* bound for Pegu. Knipe was superseded by Bradgate on the latter's arrival at Syriam in 1652. He did not stand well with the King of Burma, who had been holding up goods the Company wished to export from Martaban, and the Fort St. George Council hoped that Bradgate, who was more popular in Burmese official circles, would manage to secure better relations with the Court of Ava.⁷⁸ Knipe's conduct on several occasions had called for severe reprimand. One of his last acts as chief factor at Syriam was to despatch a ship—presumably the *Ruby*—to Madras without a bill of lading, and one is led to suspect him of a habit of appropriating the property of deceased factors which should have been surrendered to the Company.⁷⁹ His accounts were badly kept and he caused no little trouble at Syriam after his departure in 1653 by taking with him the account books for the period from March 1650 to August 1653.⁸⁰ In the absence of any references to him in the Company's records after his departure from Burma we may assume that the Company had no further use for his services.

The *Ruby* left the Coast on her second voyage to Syriam on January 20th, 1652. She should have started much earlier but apparently experienced much difficulty in getting together her necessary complement of crew.⁸¹ She left Madras with nine English seamen besides Thomas Bland her master, Robert Smith and William Mixer her mates and Robert Cowper her surgeon. She did not return to Madras until May

74. *Ibid.*, 1651-54, pp. 43-4.

75. Foster, *op. cit.*, 1651-54, p. 94. Also given in Love, *Vestiges*, I. p. 106 note 9.

76. Classed as merchant. He is mentioned as a writer at Fort St. George in 1655. In 1648 he was a member of the Fort St. George Council and as such signed a letter of that date. (Love, *op. cit.* I. pp. 63, 80, 98.)

77. Classed as accountant. This is one of the earliest references to him in the East India Company's records. The best source of information regarding this extraordinary man is Love, *op. cit. supra*.

78. Foster, *op. cit.*, 1651-54, p. 111.

79. *Vide* O. C. 2343 for a case in Burma probably relating to the deaths of Edwin and Lawrence. See also Foster, *op. cit.*, 1651-54, p. 21, for a reference to a suspiciously similar action of his in connexion with the estate of William Hicks, a deceased factor of the Courteen Association.

80. O. C. 2343, Foster, *op. cit.*, pp. 32-4.

81. *Ibid.*, 1651-54 p. 111.

of the following year, when she came in company with the *Bonito*, which had been sent to Syriam in February of that year.⁸² This long delay needs some explanation. Agent Henry Greenhill writing home shortly after her departure from the Coast expressed the opinion that she would not arrive back that year.⁸³ Unlike the larger English-built vessels she could not endure the stress of monsoon weather, and so by missing the return sailing season before the wet monsoon of 1652 she would have in all probability to wait for that of the following year. In the meantime the outbreak of the first Anglo-Dutch war in 1652, though not immediately affecting the relations between the two nations in the Eastern seas, would cause her to wait for an English ship to accompany her across the Bay.

82. *Ibid*, 1661-54, p. 155 and note.

83. O. C. 2257

CHAPTER IV.

The Failure of the Syriam Factory.

The Anglo-Dutch war of 1652-4 placed the English East India Company's agents in the East in a most uncomfortable position. The Dutch possessed a commanding naval superiority over the English in the Indian Ocean, and not only captured or destroyed several of the Company's ships, including the *Endeavour* and the *Dove*, in which the first two cargoes to Syriam had been shipped, but cooped up English shipping in port in such a way as to render trade almost impossible. Actually the Company's western factories around the shores of the Arabian Sea appear to have suffered worse than those on the Coromandel Coast and Bay of Bengal.

The Dutch made no attack upon the English within the limits of the Fort St. George presidency, but on account of their general predominance in the Eastern seas and on the trade routes the Fort St. George factors were literally at their wits' end as to how to get cargoes through to England during most of the year 1653 and the early part of the following one.

Of the effects of the war upon the Company's trade with Burma we have very meagre information. In 1653 the Syriam factors reported to Fort St. George that the Dutch in Burma offered no "harme or violence" but did their best "to render us odious to the people."¹ For want of English ships they were compelled to make use of Dutch shipping to carry their correspondence. The following extract from one of their letters illustrates the methods they employed to guard against the interception of their letters by the Dutch :

"And for as much that at present wee are confined to our enemies shipping (which are all three bound in companie for Bengala) to bring this towards you, wee shall say the lesse or at least noe more then that in case they should bee intercepted by them which they will narrowly search for, it shall doe them noe good, nor us any harme, but the confidence wee have of the bearer, beeing one of the Nabobs² servants which taketh his passage on one of their ships, with the great desire wee have to present our respective salute unto your worships etc., invits us to this single paper wherein wee shall in breefe answeere some points recommended to us, and some other matters extant with us."³

This letter, dated October 25th, 1653, was received in Fort St. George late in December 1653 or early in January 1654 by way of Bengal and

1. O. C. 2343.

2. i. e., Meer Jumla.

3. O. C. 2343.

Masulipatam.⁴ In the same letter the Syriam factors mentioned that the Dutch had intercepted and detained a letter sent from Fort St. George by a Dutch boat which had arrived in Syriam in May 1653. They had received the letter, however, by a native boat on October 8th. It was dated March 7th. They further related that they were in great straits for want of paper and ink, having previously relied upon the Dutch factory in Syriam for their supplies of these necessities.

We hear of only one other instance of Dutch hostility towards the English in Burma. Although it belongs to a slightly later stage of our narrative, it may be conveniently related here. The *Expedition*, was due to have sailed from Syriam to Fort St. George at the beginning of the dry monsoon of 1653. Her departure was, however, delayed because three Dutch ships lay in wait for her. The Fort St. George factors managed to warn her of her danger by a message carried by a junk belonging to Meer Jumla, whose regular trading operations in Burma have already been noted. Shortly afterwards one of the blockading ships was wrecked a little south of Narsapur on the Coromandel Coast.⁵ But the *Expedition* was effectively prevented from leaving Syriam for the rest of the war. She did not in fact reach Madras until March or April 1655.⁶

The Dutch were undoubtedly in a far stronger position than the English in Burma. Consequently they secured better treatment not only from the Court of Ava, but also from the local officials, to whose palms they were in a better position than the poverty-stricken English Company to apply the requisite amount of grease. The letter written by Bradgate and his colleagues from Syriam in October 1653 and already referred to above,⁷ contains an interesting illustration of their success in dealing with the Burmese government. "A small vessell of theirs which they formerly took from the Portuguese came hither in July last," they write, "which they say was bound for Batavia, having aboard her 14 B^a 8 of course cloth, which were taken ashore but not customed⁹ and after great expence in bribes they have lycence to relade the same goods and depart with the ship and men, of all which (according to the Country Custome) it was generally thought the king would have seized on as his owne, they relateing themselves without examination that they were forced hither by fowle weather, but hee hath showed himself more generous to them then usuall (beeing incited thereto by the Grandees who were well paid for their paines)." The same letter mentions the unexpected arrival of a Dutch fly-boat, the *Overskeet*, which, to the great surprise of the English, was given permission to depart by the Burmese governor

4. Foster, *op cit.* 1651-54, p. 221.

5. O. C. No. 2358. Foster, *op. cit.* 1651-54, p. 220.

6. Foster, *op. cit.* 1655-60, p. 33.

7. O. C. No. 2343.

8. Bales

9. *i. e.*, customs duties had not been paid on them.

THE FAILURE OF THE SYRIAM FACTORY.

of Syriam without having to deliver up a portion of her arms and ammunition. The writers hint that the large annual presents made to the king and important officials by the Dutch were the cause of this generous treatment.

In February 1653, Fort St. George deemed it unsafe to send the *Bonito* to Bantam; she was therefore ordered to accompany the *Expedition* from Masulipatam to Syriam. With the two vessels went Agent Henry Greenhill. It would appear from two letters written from Bantam¹⁰ and Surat¹¹ respectively, regarding this voyage, that Greenhill carried to the Syriam factors their earliest official news of the outbreak of war with the Dutch. In the absence of definite information we are left to guess the object of Greenhill's visit to Burma. A passage in the Syriam letter of October 25th, 1653, already referred to on several occasions above, gives the impression that he went there to make enquiries into the general state of affairs in the Company's factory and into Knipe's mismanagement of the accounts. The writers thank Greenhill heartily for his pains in making up their accounts, and express the hope that in future they will be able to send them in fully made up and in proper form. They proceed to explain that most of the confusion was due to Knipe's negligence. As Greenhill returned to Fort St. George on the return voyage of the *Bonito* in April 1653, he cannot have made the long river journey to Ava during his stay in the country. His mission, therefore, probably had nothing to do with the establishment of better relations between the Company and the Burmese government. One is tempted to conjecture whether he went thither purely upon the business of the Company.

Martin Bradgate, who had returned to Syriam on board the *Ruby* in 1652, left shortly afterwards for Ava, which he reached on June 3rd. He was greeted by the news that the Company's warehouse there had been destroyed by fire, and with it 1655 viss 24 ticals of gansa. Having with him a consignment of goods for sale belonging to the United Joint Stock, and no place in which to store them, he was obliged to hire a warehouse for six months at a rent of 50 viss of gansa¹² per mensem. He had also to spend 1340 viss upon building a new house for the Company.¹³ Very little information is to hand about this trading post at Ava. It was presumably established by Breton and Potter after their ill-starred journey to Ava in 1648. In the Original Correspondence there are references to an "Ava Journall and Leidger for the United Joynct Stocks accompt for the yeares 1653 and 1654," and to an "Ava and Syrian Journall and Leidger for the ffourth Joynct Stocks accompt 1650 to 1654."¹⁴ This trading post at Ava is never referred to in the records as a separate

10. O. C. Nos. 22² and 2284.

11. O. C. No. 231.

12. A viss of gansa was then worth about one shilling and four pence sterling. *Vide* Chap. V.

13. Foster, *op. cit.*, 1651-54, p. 207.

14. O. C. No. 2541.

factory. Apart from the fact that Ava was the capital of the kingdom, it was not a good trading centre, and the Company probably maintained a house there rather for the ready access it commanded to the royal car and the royal godowns than for any more general commercial advantages they hoped to reap through the maintenance of a resident there. It was, however, possible to carry on a certain amount of direct trade of a profitable nature with the king, into whose storehouses at the capital there flowed an unending stream of revenue in kind.

The city of Ava, first made a royal capital after the fall of Pagan at the end of the 13th century A.D. was almost continually in Shan hands until its annexation by Bayinnaung in the 16th century. While the Toungoo dynasty maintained its capital at Pegu, Ava remained a provincial capital presided over by vassal rulers or viceroys. But the silting up of the Pegu river robbed the city of Pegu of its commercial advantages and paved the way for the rise of Syriam as the chief trading centre in Burma. The cessation too of the successive Burmese attempts to conquer Siam caused Pegu, the scene of a fearful disaster at the close of the 16th century, to lose its strategic importance in Burmese eyes, while the hostility of the Talaings to the Burmese dynasty that had brought such terrible devastation upon them and their fruitful land, helped to provoke a reorientation of Burmese policy that represented a complete reaction from that inaugurated by the statesmanlike Tabin Shwe Hti. In 1635, King Thalun removed the capital to Ava, which thenceforward, until captured by the rebellious Talaings in 1752, remained the capital of Burma.

Mr. Harvey is rightly of opinion that a move to Syriam would have accorded better with the country's destiny.¹⁵ But no one who has devoted any attention to the trade policy of the Burmese kings—if indeed their actions in this respect may be dignified by the application of such a term—will find any cause for surprise that the commercial importance of Syriam never led Burmese kings to consider it as a possible royal capital, notwithstanding the striking lesson read to Burma by the Portuguese adventurer Felipe de Brito. Ava's political importance lay in its ancient traditions and the fact that it was in the centre of the more strictly Burmese districts of the country. Economically it was attractive to the Burmese court because it was situated at the junction of the Irrawaddy with its tributary the Myitngè, along which the rice of the Kyaukse district could be brought to supply the city. It had few, if any, real commercial advantages. Its sole importance as a trading centre was derived from the fact that as a royal city it attracted to itself a large, though mainly uncommercial, population.

Martin Bradgate during his stay in Burma resided chiefly in Ava, probably in order to use his influence with the Court to secure favourable trading conditions for the Company. Through him a certain amount

¹⁵ *Op. cit. Supra*, p. 193

THE FAILURE OF THE SYRIAM FACTORY.

of correspondence was carried on between Fort St. George and the Burmese Court as a result of which the Company secured a rebate of customs duties on some of their imports into the country.¹⁶ In October 1653, the Syriam factors reported that he had recently arrived down from Ava, and was about to return thither in order to get the necessary permission for the Company's ships to depart the country whenever they pleased. We gather from their letter that this method of direct negotiation with his Burmese Majesty was the cheapest way of getting things done.¹⁷ Bribery in Burma was an extremely expensive business.

The high hopes of the successful development of the Burma trade entertained by the Fort St. George Agent and Council as a result of the voyages of the *Endeavour* and the *Dove* gradually faded away. The rubies that the Company hoped to get cheaply from the land of their origin, proved so costly to procure that bills of exchange raised upon them according to their value in Burma could not be realised to their full amount in the Indian market. Consequently in 1652 Greenhill and his Council reported that "the Pegu factors . . . durst not adventure to bring us any (rubies) thence for the account and they did well therein."¹⁸

On the other hand good supplies of lac could be procured. Early in 1652 Fort St. George was able to send home 4,000 lbs. of this commodity in addition to a cargo despatched for sale in Persia, and Agent Henry Greenhill estimated that he could send home fifty tons annually if the Company required it.¹⁹ He further reported that mainly because of the large returns from Burma he was able to turn over stock to the value of over 37,000 rials from the Fourth Joint Stock's to the United Joint Stock's account, and was therefore encouraged to prosecute the trade to Burma "notwithstandinge the trouble and difficulties thereof."

In 1653, however, the English trade took a decided turn for the worse. "Instead of amendments of the tymes here with us, wee rather finde it to bee daily worse," wrote the Syriam factors in October of that year.²⁰ The prices fetched by imported goods, they continued, tended to fall, while country produce and merchandise were considerably dearer than previously. The Burmese government had prohibited, on pain of death, the sale of tin or ivory to foreign merchants, and in order to prevent the smuggling of these articles out of the country had set "diverse new watches . . . in the way to Martavan, from whence most part of those comodities were formerly brought."²¹ They would therefore, they reported, be unable to get the goods due to them

16. Foster, *op. cit.*, 1651-54, p. 207.

17. O. C. No. 2343.

18. O. C. No. 2246.

19. O. C. No. 2246.

20. O. C. No. 2343.

21. Foster, *op. cit.*, 1651-54, 207.

and so would have to take money instead. Moreover they could not hope to send much gansa because the export of this had also been stopped "and there may not be brought from Pegu more than will defray expenses in Sirian and not to exceed 200vt²² at one time, for which wee must have a pass." They then proceeded to relate the following incident: "The Dutch, a while since, endeavouring by night to pass by the juncans²³ with a boate wherein was laden 3,000vt gance, were persued and taken, and the men brought backe bound and suffered imprisonment till such time as the factors here with costly bribes had mitigated the Princes wrath; which after three daies obteyned their manumission. The gance is transported into the Kings godownes, where it remains dormant." It was so difficult to get commodities for export, they wrote, that had the *Expedition* not been delayed in Syriam port for other reasons, she would have had hardly any cargo with which to return to the Coromandel Coast.

So it happened that whereas in the early part of 1652 the Fort St. George Agent and Council had written home explaining that their large stock was due chiefly to the returns from Pegu, in November of the following year they reported that they could barely make ends meet because of the failure of the Burmese trade.²⁴ "Our Pegu friends," they complained, "complied not with the $\frac{1}{2}$ of what wee expected from them." On the other hand the "Pegu friends" seem to have had some cause for complaint at the quality of the goods they were expected to vend profitably in Burma. In a letter written by Greenhill and Gurney at Fort St. George to the Company in January 1652 occurs the following significant passage: "Lastly, be pleased to take notice that wee are advised from the Bay the Broadcloth sent thither proves soe damnified as it will not vend there, for which cause it is intended to Pegu."²⁵ One is led to think that this was not an isolated case of dumping inferior goods upon Burma, since we find it asserted in 1654 that the goods sent to Pegu from Masulipatam were proverbial for their badness. "If it come from Metchlapatam, wee will not medle with it," the Syriam factors are reported to have said.²⁶

By the end of the first Anglo-Dutch war the East India Company's affairs were in a critical condition. The flotation of the United Stock, resulting from the Company's agreement with the Assada Merchants at the end of the year 1649, had not succeeded. For this the economic condition of England at the close of the Great Civil War was responsible. Fluid capital was almost exhausted. Only one-tenth of the advertised capital of the United Stock had been actually subscribed. Many of the Assada merchants refused to join the new Joint Stock and continued

22 i. e., viss

23. Customs officers (from *chungum*, a toll) Foster, *op. cit.*, 1655-60, p. 41, n.

24. Foster, *op. cit.*, 1651-54, p. 213.

25. O. C. No. 2246.

26. Foster, *op. cit.* 1651-54, p. 305.

their interloping operations in the Indian Ocean. Capital was so scarce that in 1651 no ships could be sent out to the East, and the General Court actually debated whether the formality of electing officers should be discontinued. A number of London merchants was pressing for either the abandonment of the joint stock system of trade in favour of the regulated system or the opening of the trade to all comers. It was represented that the Company was able to carry on so little trade on its own account that its retention of its monopoly was nothing short of farcical. Again in 1653, when the United Joint Stock expired, the Company was unable to send ships out to the East.²⁷ Added to these difficulties the Dutch war, as we have seen, had brought English commerce in the eastern seas almost to a standstill.

Faced by such a situation, with Cromwell and the Council of State turning a deaf ear to all their entreaties for help against the interlopers, the Directors decided to reduce considerably the scope of the Company's trading operations. In May 1654, therefore, the Surat Presidency received instructions that its factories were to be reduced to Surat, Agra, Ispahan and Gombroon, while those of the Madras Presidency were to be reduced to Fort St. George and Masulipatam only. The execution of these orders in the latter presidency would involve the closing of the factories at Balasore in Orissa, Hugli in Bengal, Bantam in Java, Jambi in Sumatra, Macassar in Celebes, Camboja in Indo-China and Syriam in Pegu.²⁸

Fort St. George received news of this decision by a letter from the Company brought by the *Three Brothers* in the middle of September 1655. It was therein ordered that with the reduction of the factories to two in number only "noe more but three factors shall be continued in both places, namely, two at the Fort and one at Masulipatam; which number wee conceive will be sufficient, wee having at present noe other occasion wherein to imploy them, except to preserve and maintain those privileges and immunities which wee have in those parts."²⁹ It was further ordained that Thomas Chamber, William Palmer and Martin Bradgate, who had returned from Burma—presumably on the *Expedition*³⁰—were to be offered the three posts. The Fort St. George President and Council immediately set about carrying into effect the ungrateful task imposed upon them by this order. On October 16th, 1655, President Greenhill, Thomas Chamber and Martin Bradgate held a consultation at Viravasaram at which it was decided to recall William Jearsey and Robert Cooper from Syriam, leaving behind Francis Yardley upon a salary of "10 old pagodas or 100 veists gance at most per month . . . to gather in as

27. Hunter, *British India*, II. p. 119.

28. Foster, *op. cit.*, 1655-60, p. 6.

29. *Ibid.*, 1655-1660, p. 35.

30. I can discover no actual mention of his return in the records. He was in Fort St. George at the time of the arrival of the "Three Brothers." Foster, *op. cit.*, 1655-1660, p. 37.

many of such debts standing out as are [not] desperate and to looke after the howses and dock (which are of value and importance); all which upon the utter desertion of those factoryes would bee lost and seized on."³¹

A letter written home to the Company by William Curtis and John Chambers, supercargoes of the *Three Brothers*, and dated December 27th, 1655 "ready to sayle for Bantam out of Madraspatam rode," explained the reason for this delay in closing the Syriam factory.³² "Why wee have transgressed soe far from your Worshipp's wish is for these following reasons. Those ffactors in Pegu had made soe many debts and have put you to soe much charge in bilding houses, dockes and other accomodacon that if wee withdrawe the ffactors all your privileges debts and accomodacon will bee lost therefore it is thought fitt that Mr. ffrancis Yardley shall remaine in Serian & hould the Companies privileges and gather in theyre debts." Greenhill and Chamber writing home in the following February gave further stress to this last point.³³ "For there is hopes to recover in diverse debts and by late advise[s] from thence they have gott in many thousands veists of gance that wayt but a conveyance hither," they explain with great plausibility. But the truth of the matter was that in the absence of supplies of capital from home and through their consequent inability to carry on trade on the Company's behalf, the Coast and Pegu factors had very naturally employed their time in feathering their own nests. Most of them were so deeply engaged in trading on their own account in Burma that the immediate dissolution of the Syriam factory would have been a very serious matter for them.³⁴ "Mr. Bradgate in his voyage hath made soe many debts in Pegu," wrote Curtis and Chambers in the letter already quoted above,³⁵ "on his account alone you are forsed to keepe that nedles ffactory; and at his returne to the ffort³⁶ his cash, his credits in Pegu and all his sallary will not ballanc his accompts." Both William Jearsey and Francis Yardley became notorious later on for their extensive private trading, which they carried on in defiance of the loudest thunders from London.

Jearsey and Cooper were instructed to return to Madras bringing with them the fabulous supplies of gansa on board a Dutch ship on which passages had been booked for them by arrangement with the governor of the Dutch factory at Pulicat.³⁷ They were expected back at Fort St. George in April 1656. Cooper returned on this boat but without the gansa. It remained behind in Jearsey's charge, since he refused to travel on a Dutch boat and insisted upon waiting to return on the *Expedition*, "for the Creditt of the Nation (as hee said) beeing an English ship," wrote Greenhill and Chamber somewhat incredulously home

31. O. C. No. 2537.

32. O. C. No. 2515.

33. O. C. No. 2537.

34. Foster, *op. cit.*, 1655-60, p. 40, quotes an interesting Dutch letter from the Hague. Transcripts (ser. i. vol. xxi no. 64) on this subject.

35. O. C. No. 2515.

36. Fort St. George.

37. O. C. No. 2537.

THE FAILURE OF THE SYRIAM FACTORY.

to the Company.³⁸ But it is significant that this ship, which had recently been bought of the Fort St. George establishment for 2,000 old pagodas and her name changed to the *Prosperity* by that indefatigable private trader, Edward Winter, then chief factor at Masulipatam, was trading in Syriam on her owner's behalf. She was expected to sail from Syriam three days after the Dutch boat upon which Cooper travelled. But by the following November neither Jearsey nor the gansa had materialised, and although Fort St. George still optimistically held out hopes that the amount of gansa to be realised was "neere 20 candy. . . . which might yeelde heere neere 800 pagodas new," they reminded the Company that Winter's ships were usually unfortunate.³⁹

What ultimately transpired is related in Greenhill's and Chamber's next general letter to the Company from the Fort dated January 28th, 1657.⁴⁰ "Wee formerly advised your Worppes of 7 or 800 pagodas got together of our Pegu Remaines, and how wee had procured passage for Mr. William Jearsey (your chiefe there) to bring it with him on a Dutch shipp which opportunity hee neglected for a passage on the *Expedition* that lost her Monsoone,⁴¹ and but lately arrived with him at Metchlepatam, who not coming hither himselfe, sent his accompts on the Dethick⁴² by which wee find a great part of that summe expended in his stay there; contrary to order, besides £100 in ready money taken thereout on accompt of his small wages, which disorderly proceeding, wee noe way approve of, but will speedily endeavour to exact a reason from him (if reason can be given) for such irregular courses, and as soone as possible may bee, recall ffancis Yardley your sole ffactor now in Pegu, being informed from thence but little more of your estate is recoverable in those parts unless bee the sale of your howses etc. which wee suppose will turne to a poore accompt."

Jearsey's departure from Burma at the end of the year 1656 really brings to a close the history of the Company's first factory in Syriam. We have no exact information as to the date of Yardley's return to the Coast. In 1659 he was in Masulipatam preparing to make an interloping voyage to Burma in partnership with a certain Samuel Cropley,⁴³ also previously a Company's servant.⁴⁴ Probably he left Burma not later than the year 1657. At the end of volume 25 of the Original Correspondence there is a "List of ffactory's and places where books have been kept since 1658;"⁴⁵ no place in Burma appears in this list. Probably therefore, we are right in concluding that the Syriam accounts were closed before 1658.

38. Foster, *op. cit.*, 1655-60, p. 102. O. C. No. 2579.

39. *Ibid.* The book rate of the pagoda was at this time 8 shillings sterling.

40. O. C. No. 2610.

41. *I.e.* failed to leave Syriam before the beginning of the wet monsoon.

42. A private ship.

43. Foster, *op. cit.*, 1655-60, p. 271.

44. *Ibid.* 1655-60, p. 258.

45. O. C. No. 2726.

Apparently the Company never formally surrendered its possession of the Syriam factory site. At a Court of Committees for the United Joint Stock which sat on October 14th, 1656, to value the properties of the Company in the East for the purpose of selling them outright "to some Englishmen,"⁴⁶ property in Pegu⁴⁷ was credited to the Company. At the end of the following year also, when as the result of the grant of a new charter by Cromwell a "New General Stock" was subscribed, and the new undertaking agreed to take over at a valuation all the property of the Company in the East, a house at Pegu is mentioned in the list of goods, privileges, buildings, etc. owned by the Company.⁴⁸ It almost seems as if the closing of the Syriam factory was regarded by the Company's servants at first as merely a temporary measure due mainly to the critical condition of the Company's general affairs, and partly to the fact that the trade was unprofitable. Although for over twenty years no attempt was made to reopen the factory or even to maintain possession of it, the Company continued to regard itself as the possessor of property in Burma. Thus when in 1680 Sir Streynsham Master began to negotiate for the reopening of direct trade between the Company and Burma, and commissioned Joan Perera y Faria Junior to proceed to Ava for the purpose of presenting certain "Articles of Commerce" to its king, the Fort St. George Council passed the following resolution: "Whereas the Company have ground and houses standing thereupon at Seriam, Pegu and Ava which are and have been made use of by strangers for some years past, It is Resolved to give Joan Perera de Faria Junior order to take possession of the said houses."⁴⁹

From this we may infer that when the Company closed its factory in Syriam, the private traders, some of whom, such as Jearsey and Yardley, who had already been to Burma in its employment, continued to use its houses and land. These two men, like so many others who were dismissed the Company's service owing to the economy cuts of the Commonwealth period and found themselves stranded in the East without even passages home provided for them, went to Masulipatam and turned private traders. Jearsey was for some time in association with Sir Edward Winter who carried on an extensive private trade with Arakan, Burma and Tenasserim. It has been related above how Jearsey returned from Syriam to the Coromandel Coast late in 1656 or early in 1657 on one of Winter's ships. In the latter year Winter was freighting a vessel named the *Tiger* at Masulipatam for a trading voyage to Burma, when she capsized with

46. Court Minutes 1655-59, p. 116. Hunter, *op. cit.* II, p. 124.

47. The country, not the city is meant here.

48. Foster, *op. cit.*, 1655-60, p. 141.

49. Factory Records Fort St. George, vol. 2., p. 28 (March 1st, 1679-80). The word Pegu is applied somewhat loosely by writers of this period to both the city of that name and the territory later known as Lower Burma. Here it reads as if the city is meant. No English factory seems ever to have existed in the city of Pegu. Probably the equivocal use of the word in earlier documents is responsible for this error on the part of the Fort St. George Council.

all her passengers and freight, and was completely wrecked. The loss was reckoned at not less than 50,000 pagodas.⁵⁰ Little wonder that Winter's boats had a bad name.

After its reorganisation by Cromwell the Company began to take stronger measures against the interlopers and other private traders. Orders were accordingly sent out for the ships and goods of all such persons to be confiscated.⁵¹ Complaints regarding the operations of Winter and Jearsey had already been made to Fort St. George,⁵² and the Masulipatam factors were ordered to arrest these daring traders. Their defiance of the Company's orders caused even the Surat Council to take up the matter.⁵³ Little, however, was done. Probably the Company's servants themselves were too deeply involved in the business to take the necessary drastic measures. A ship of Winter's, the *Winter Frigate*, which Jearsey and Thomas Turner were freighting for a voyage to Burma, was seized, but although the Fort St. George Council threatened to go themselves to Masulipatam to "unroost" the private traders, the illicit trade to the Eastern coasts of the Bay of Bengal could not be put down. It is unnecessary here to pursue further the fortunes of Winter⁵⁴, Jearsey and the other interlopers⁵⁵ who traded to the ports of Arakan and Burma during the period between the closing of the Company's factory at Syriam and the embassy of Joan Perera y Faria Junior to Ava. Only scattered references to their connexion with Burma are to be found in the East India Company's records, and these are usually too vague to be of much value or interest.

One is tempted to wonder why after Cromwell's reorganisation of the East India Company the old factory at Syriam was not reopened. Probably the restriction imposed upon trade by the Court of Ava constituted the chief reason. The official records of a later date explain the Company's withdrawal from Burma in 1656-7 as due to unprofitable trade and the attitude of the Burmese government. "It was the trouble we suffered under the government in Pegue which caused us to Relinquish our trade in that Country heretofore", wrote Sir Streynsham Master in his instructions to Joan Perera y Faria Junior in 1680.⁵⁶ In 1683 the Directors wrote to Fort St. George that the Company had previously withdrawn its trading posts from Burma "because y^e Trade of such places did not maintain y^e Charge of y^e Factory Presents &c"

50. Foster, *op. cit.*, 1655-60, p. 137, 50,000 payodas-about £20,000.

51. *Ibid.*, 1655-60, p. 151.

52. *Ibid.*, 1655-60, p. 185.

53. *Ibid.*, 1655-60, p. 273.

54. Winter gave up the struggle shortly afterwards and left for England with his wife, family and estate in January 1660, having made his peace with the Company. He returned to Fort St. George two years after as President and his subsequent career was romantic.

55. Christopher Hatton, Chief at Masulipatam 1678-1680 had, previously to his appointment to the Company's service in 1670, traded in Burma for eleven years. *Vide* Temple, *Diary of Streynsham Master*, II, p. 135.

56. Factory Records, Fort St. George, *Diary and Consulation Book* January 1680-1681, pp. 17-19.

but wee must confess Wee think y^e fault might not altogether be in y^e places, but in y^e men, Management and direcon of them."⁵⁷ Possibly the reopening of the Ayuthia factory in Siam in 1662 after nearly forty years of disuse partly explains the Company's neglect of Burma during this period. The policy of Siam towards foreign merchants was far more enlightened than that of Burma. In 1659 when the Cochin-Chinese plundered the English and Dutch factories at Camboja, the fugitive factors were given such courteous and kindly treatment in Siam by the king⁵⁸ that the Company cannot have failed to make mental comparisons between the two Indo-Chinese governments. In 1663 the Court of Directors placed the Siam trade under Fort St. George on the ground that the cotton goods obtained from the Coromandel Coast were the best for the Siam market. But for some years the trade was comparatively unsuccessful, partly owing to Dutch opposition and to the effects of the Second and Third Dutch wars, and partly owing to the private trading ventures of Sir Edward Winter and William Jearsey.⁵⁹ Nevertheless the extremely friendly attitude of the Siamese king and his willingness to grant trading licenses on generous terms made the Company continue to prosecute its Siamese trade, in preference to that with Burma, during the seventh and eighth decades of the 17th century.

57. Records of Fort St. George; Despatches from England 1681-86, p. 38.

See also Dairymple, *Oriental Repository* II, p. 345, where in his instructions to Fleetwood and Lesly in 1695 Governor Nathaniel Higginson of Fort St. George says that the Company withdrew its previous factories from Syriam and Ava "the trade proving unprofitable".

58. Anderson, *English Intercourse with Siam*, p. 89.

59. *Ibid*, pp. 90-11.

CHAPTER V.

Conditions of Trade Experienced by English Merchants in Burma in the 17th Century.

Although the East India Company did not think it worth while to establish a factory in Burma until nearly the end of the first half of the 17th century, a certain amount of trade was done with the country through Muslim ("the Moors") merchants who made the yearly excursion from the Coromandel Coast to Syriam at the end of the wet monsoon. Through these intermediaries they obtained from Burma such things as Martaban jars, small supplies of gold, copper, tin and benzoin, and particularly gumlac.

Burmese gumlac seems to have been the best procurable in the East in the 17th century. The great demand for this commodity in those days was occasioned mainly by its extensive use in the manufacture of sealing-wax. At the end of the 16th century Linschoten was much impressed by the excellence of Burmese lac and included in his "Voyage to the East Indies" a full account of the manner of its production.¹ In his abridged version of this famous compendium of commercial information Purchas adds the following interesting note on the use to which lac was put: "They beate the *Lac* to powder, and melt it, and so mixe all manner of colors upon it as they list, red, blacke, greene, yellow, or any other color, and make peeeces thereof, such as are sold here to seale letters withall."² Linschoten mentions the existence of much trade in this commodity between Burma and Sumatra, where it was bartered for pepper, and whence it was carried to the Red Sea ports, Arabia and Persia. William Methwold in his "Relations of the Kingdome of Golchonda"³ describes the trade between that kingdom and Pegu in the following terms: "To Pegu they export much Silver in Rials of eight, Cotton yarne, and Beethyles⁴ dyed red, with several sorts of paintings, and bring from thence the perfect Rubies and Sapphires which are dispersed through the World, much Gold, the best Gum Lack, with some Tin and Quicksilver." Methwold, while at Masulipatam, on several occasions sent home small quantities of Burmese lac.⁵ But the large general demand for this useful article made the supply of it uncertain and often caused its price to rise very high. In December 1623 President Brockedon at Batavia wrote home to the Directors that the price of lac in Masulipatam depended upon the supplies coming from Pegu and Tenasserim, which were most uncertain.⁶ Methwold considered Burmese lac so superior to the Indian variety that he

1. Vol. II, pp. 88—9, Hac. Soc. Edition.

2. Purchas, *op. cit.*, II, p. 1784, Maclehose reprint X, p. 315.

3. Purchas, *op. cit.*, V (1626 Ed.) p. 1004.

4. A kind of Muslin, *vide* Hobson-Jobson s. v. Betteela, Beatele.

5. Foster: English Factories 1618—21 p. 343 and 1622—23, p. 45.

6. Foster, *op. cit.*, 1622—23, p. 338.

always kept a watchful eye on the the Pegu market.⁷ Burmese lac, he wrote in 1636, "doth afford to our knowledg a farr deeper tincture (than Indian) and would therefore be more valued in the generall use whereunto it is now employed."⁸ Three years later President Fremlen at Surat wrote home to the Company of it as a sort "which noe part of the world besides can aequall." "William Methwould," he continued, "remembreth to have sent you such from Mesulapatam, when the way to make use of the tincture was hardly known in England."⁹

Martaban jars—often called Pegu jars—were in great demand in those days for storage purposes on board ship, as well as for ordinary household use. Extremely large ones could be procured. We are told by an 18th century visitor to Martaban that he saw some large enough to contain two hogsheads of liquor.¹⁰ Being low conductors of heat they were used for carrying fresh water and grain on the merchant vessels of the Indian Ocean.¹¹ The East India Company records of the 17th century contain many references to them showing how widespread was the demand for them. In view of the large number of references to them that are to be found collected together in that mine of information, Hobson-Jobson, one instance alone, culled from a more recondite source, must suffice. In August 1650 the Bantam factors wrote to Fort St. George: "When it shall please God to arrive the shipp from Pegu wee desire you to fitt us with as many great Martavans as possible you can and to send us by the first conveyance fild with rice and wheate or in case you have any at present by you, pray send us them."¹²

Bullion was always a welcome commodity to the Company. Having in the teeth of much opposition to export bullion from England for trading purposes—in those days England produced few articles of commerce that found a ready market in the East—the Company was always on the look out for possible supplies in the East that would partially or wholly relieve it of this difficulty. Its early attempt to exploit the Japanese trade was inspired largely by the desire to obtain silver. In fact a project for coining silver in Japan for exchange purposes in Siam and Burma was once discussed, but came to nothing because it was found to contravene the law of the land.¹³ Gold could be bought for silver at great profit in the bazaars of Pegu. Japanese silver, the factors at Batavia wrote home in 1627, could be exchanged for gold in Pegu at nearly 100 per cent. profit.¹⁴ The great demand for silver in Pegu had its counterpart in a corresponding demand for gold on the Coromandel Coast. In the first

7. *Ibid*, 1634—36, pp. 66, 146.

8. *Ibid*, 1634—36, p. 146.

9. *Ibid*, 1637—41, p. 94.

10. Hamilton: A New Account of the East Indies II, p. 63. He visited Burma in 1709.

11. Linschoten, *op. cit.*, I, pp. 30, 268, etc. (Hac. Soc. Edition) See also Hobson-Jobson s. v. Martaban, where many references to them are collected from works covering the period 1350—1851.

12. Factory Records, Java, Serial No. 3, Part III. 16 August 1650.

13. *Vide* letter of William Adams in Purchas, *op. cit.* II (Maclehose Edition) p. 338; C.S.P.C.E.I. 1617—21, Nos 86, 226; Anderson, *op. cit.* pp. 68, 86, 101—2, 192.

14. O. C No. 1256, calendared in C.S.P.C.E.I. 1625—29, p. 373.

CONDITIONS OF TRADE IN BURMA IN THE 17TH CENTURY.

half of the 17th century the main coinage used by the Company's factors for trading purposes in the Bay of Bengal consisted of the gold pagoda, the standard coin of South India since the days of the Hindu Empire of Vijayanagar, and its subsidiary coin, the fanam, also of gold, though with a very large percentage of alloy.¹⁵ The Company found it more profitable to pay its Coromandel weavers (who produced the cotton piece-goods, the main article of commerce exported to the eastern side of the Indian Ocean) in gold than silver, the former, according to report, "being more easily concealed from their Governors."¹⁶

Although Burma imported silver in the 17th century, it was not used for monetary purposes. The Burmese had no coinage proper until 1861 when King Mindon introduced one adapted to that of British India. Payments for merchandise in Burma in the 16th and 17th centuries were made in gansa (bell-metal), a mixture of copper and lead, according to Caesar Fredericke¹⁷. According to Caesar Fredericke merchants were accustomed to specify "that their paiment shall be in so many *Ganza*, and neither Gold nor Silver: because that with the *Ganza* they may buy and sell everie thing with great advantage."¹⁸ Payments in gansa were made by the viss.¹⁹ As however, there was no fixed standard maintained by government, the actual value of the metal varied much according to the amount of lead alloy in its composition. It is impossible therefore to give its equivalent in English money of that period with any exactness. In 1650 the East India Company's factors at Swally Marine sent home the accounts of the first venture to Syriam in "vists of gance," stating that "each vest is nearest 16*d* starling."²⁰ Owing to the grave risk of fraud in payments made in such unregulated specie currency, the services of an assayer²¹ were employed by merchants in transactions involving a large sum of money.²² These intermediates were remunerated at the rate of one per cent. of the amount of the sale.²³

Foreign merchants trading to Burma in the days before the British occupation had to conduct all their purchases of commodities for export through another class of broker appointed for this purpose by government. The tarega,²⁴ as this half-official half-broker was called, is mentioned

15. *Vide* Note I to Chapter II.

16. Foster, *English Factories 1624—29*, p. 181. C.S.P.C.E.I. 1625—29, pp. 370—373.

17. Sanskrit kansa, bell-metal. *Vide* Hobson-Jobson s. v. Gansa. Ralph Fitch calls it "a kind of brasse" (Purchas, *op. cit.*, II (1625 Ed.) p. 1739 Macle hose reprint X, p. 191) Hamilton (II, p. 41) calls it simply lead, but he was probably ignorant of its composition.

18. Purchas, II (1625 Ed.) p. 1718. Macle hose reprint X, p. 132.

19. one viss = 3 lbs. 5 oz. 50 dwt. avoirdupois. Cf. Caesar Fredericke in Purchas, Macle hose reprint X, pp. 131—2, "This Ganza goeth by weight of Byze (= viss), and this name of Byza goeth for the account of the weight, and commonly a Byza of a Ganza is worth (after our account) halfe a Ducket, litle more or lesse: and albeit that Gold and Silver is more or lesse in Price, yet the Byza never changeth: every Byza maketh a hundredth Ganza of weight, and so the number of the money is Byza."

20. O. C. Duplicates No. 2147.

21. Burmese "pwe-a" (broker).

22. On this point see R. C. Temple, "Currency and Coinage among the Burmese" Chapter 4, in *Indian Antiquary* 1897 pp. 197—204.

23. This system remained in vogue in Upper Burma until long after the introduction of minted coins by Mindon Min in 1861.

24. *Vide* Hobson-Jobson, s. v. Tarega.

in European accounts of Burma in the 16th century when his remuneration seems to have been at the rate of two per cent. of the amount of the transaction. The writers of the end of the 18th century, however, give it as only a half per cent.²⁵ He seems to have been employed by government to put a check upon the export of certain commodities. The export of various kinds of bullion, particularly gance, was usually forbidden. Saltpetre also might not be exported.²⁶ Sometimes too tin and ivory might not be taken out of the kingdom.²⁷ These restrictions were extremely galling to the English merchants of the 17th century and were a contributory cause of the rupture of direct trading relations between the East India Company and Burma after the short-lived Syriam venture (1647—1657).

Foreign traders and trading prospectors who came to Burma in the 16th and 17th centuries found their journeys to and from the "land of pagodas" dominated by the North-East and South-West monsoons, which imposed upon travellers certain definite sailing seasons. It was customary for ships proceeding to Burma from the Eastern Coast of India to set out in September just as the South-West monsoon was on the change. With regard to the outward voyage the Venetian traveller, Caesar Fredericke, who came to Burma in 1569, has some interesting observations. "Every year there goeth a great ship from St. Thome to Pegu, of great importance," he says, "and they usually depart from Saint Thome to Pegu the eleventh or twelfth of September, and if she stay until the twelfth, it is a great hap if she return not without making her voyage."²⁸ This ship, he continues, used to set out on September 6th, but because she was laden with a particular kind of dyed cloth that required to be carefully dried, the ship's departure was put back some days to enable the cloth to be better dried. In this way she ran the risk of being unable to make the coast of Burma before the North-East monsoon set in. "For," says he, "in those parts the winds blow firmly for certain times, with the which they go to Pegu with the wind in poop, and if they arrive not there before the wind change, and get ground to anchor, perforce they must return back again: for that the gales of the wind blow there for three or four months together in one place with great force. But if they get the coast and anchor there, then with great labour they may save their voyage."

Voyagers from Bengal to Burma usually waited for the dry monsoon to set in firmly before they embarked upon their journey. Thus Caesar Fredericke writes: "Also there goeth another great ship from Bengala every year, laden with fine cloth of Bombast of all sorts, which arriveth in the harbour of Pegu, when the ship that cometh from St. Thome departeth." The English traveller Ralph Fitch, who went from Bengal to

25. Temple, *op. cit.*, p. 199.

26. *Vide* Hamilton, *op. cit.*, II, p. 41. "Saltpetre they have in Abundance, but it is Death to export it."

27. Foster: English Factories 1651—4, pp. 206—7.

28. Purchas, *op. cit.*, Macle hose reprint X, p. 128.

CONDITIONS OF TRADE IN BURMA IN THE 17TH CENTURY.

the Irrawaddy delta in a Portuguese vessel at the end for the year 1586, set out from the port of Serampore on November 28th.

William Methwold's observations on this interesting subject have been quoted above in connexion with the problem of the date of the return to Masulipatam of the envoys sent by Lucas Anthéunis in 1617 to apply for the restoration of Thomas Samuel's goods to the East India Company.²⁹ These two factors, it will be remembered, left Masulipatam on board a vessel belonging to a local rajah on September 10th, 1617. The circumstances connected with their return to the Coromandel Coast are of especial significance to this discussion. They attempted to return in April 1619, but on account of political troubles failed to obtain the necessary royal permission sufficiently early to depart before the beginning of the wet monsoon. This caused them a year's delay.

Let us take another example of this dominance of the monsoons over sailings across the Bay of Bengal. In 1647, as has been noted above,³⁰ when the Surat president and council decided to open a factory at Syriam, the *Endeavour* was sent from Surat to Fort St. George to be freighted for the voyage to Burma. Although she arrived at Madras on May 22nd of that year, she did not set sail from the Coast for Burma until September 15th. There were other reasons than climatic that partly explain her delay, but they do not fully explain it, and one is left with the impression that she was detained in Indian ports—she ultimately sailed from Masulipatam—mainly in order to wait until the customary sailing season. She returned to Madras shortly before the wet monsoon of the following year broke.

But our best source of information concerning this sailing season for boats plying between the Coromandel Coast and Burma is in the Fort St. George Diaries and Consultation Books. From about 1680 onwards for many years these contain particulars of all ships arriving at and departing from Fort St. George, Madras, in each case with the master's name and the name of the port of departure or destination as the case may be. With few exceptions we find that September was the favourite time for departure from Madras to Burma, and April the usual month for their return. A few ships leave Madras in August and October, and a few return as early as January and as late as May, but the rule applies to the great majority of sailings. The Diary for 1694 shows us three ships sailing from Madras to Burma. Two of them set sail on the 4th, the other on the 8th of September. The same Diary records the arrival of five ships from Burma, one at the end of February, one in March and three in April. The Diary of 1699 records the arrival of five ships from Burma, two of them in March and three in April. It records also the

29. In Chapter II, p. 18.

30. In Chapter III, pp. 28—9.

departure of four ships bound for Burma, one, an exception to the usual rule, on the 17th of April, one on the 31st August and two early in September.

The journey between the Coromandel Coast and Syriam took roughly three weeks or a month. Forrest and Staveley left Masulipatam on the 10th of September and arrived in Syriam on October 3rd. The *Endeavour* which carried to Burma the factors who opened the first English factory at Syriam, left Masulipatam on September 15th and sighted the coast of Burma on October 3rd though she did not actually reach Syriam until October 23rd, being delayed by contrary currents. Edward Fleetwood, whose embassy to Ava in 1695 is dealt with in the second volume of Dalrymple's *Oriental Repertory*, sailed from Madras on board the "Loyall Captain" on September 12th³¹ and arrived at Syriam on October 14th.³² When we bear in mind that at the present day Madras is only 3 days distant from Rangoon in a modern steamship, this tedious, toilsome voyage of the 17th century gives us some idea of the progress of applied science in matters of navigation.

But if the voyage from the Coromandel Coast to Burma was tedious, how much more so was inland travel. Fitch records that the journey from the bar of Negrais through the creeks to the city of Pegu took ten days.³³ Caesar Fredericke writes of the journey by water from Martaban to Pegu as taking three or four days, and explains that the water route was cheaper than the overland one for merchants with merchandise.³⁴ Forrest and Staveley in 1617 took three days to do the river trip from Syriam to Pegu in a Burmese boat with six rowers.³⁵

The removal of the capital of Burma from Pegu to Ava in 1635 imposed a severe handicap upon traders, since in order to secure permission to trade and license to depart the country, it was usually found necessary to interview the king in person. The first Englishmen to make the upstream journey from Syriam to Ava were Thomas Breton and Richard Potter, two of the factors sent to open the East India Company's factory at Syriam in 1647. Before starting they wrote to Fort St. George that the journey was expected to take not less than two months. The tragic events of this journey have already been related.³⁶ It is, however, unfortunate that we have no record of the exact dates of the departure of these factors from Syriam and their arrival at Ava. The utter inadequacy of the information contained in the letters of the East India Company's factors in Burma at this time is extremely galling to the investigator. Not a man among them had one-tenth of the descriptive powers of men such as Caesar Fredericke, Fitch or Methwold. Many letters of this

31. Madras, Public Consultations XXII, p. 318.

32. Dalrymple, *op. cit.*, II, p. 355.

33. Purchas, Maclehorse reprint X, p. 185.

34. *Ibid.*, X, p. 119.

35. *Ante*, Chapter II. p. 16.

36. *Ante*, Chapter III. pp. 31—2.

period have undoubtedly been lost, but there is not the slightest trace of anything of the nature of a diary kept by any of the Syriam or Ava factors. A description of Burma in the middle of the 17th century, written by Potter, or Bradgate or even the notorious William Jearsey, however defective, would have proved invaluable to the historian.

Not until the end of the century have we exact details of a journey from Syriam to Ava and back. These are given in the diary of Edward Fleetwood who was sent upon an embassy to Ava in 1695.³⁷ Fleetwood left Syriam on November 9th and arrived in Ava on December 23rd after what was apparently an uneventful journey. On his return journey he left Ava on February 9th, 1696, arrived at Prome on the 22nd and at Syriam on the 28th. So it was possible to accomplish the down-stream journey in a much shorter time than the up-stream one. In his diary he mentions that he was in a hurry to get to Syriam and made all haste possible, so probably he did the journey in record time. His object of course was to get his merchandise laded and the ship clear of the coast of Burma before the wet monsoon brought the sailing season to a close. He left Syriam for Madras on March 17th on the same boat upon which he had made the outward voyage to Burma, but either she took an exceptionally long time to get clear of the coast, or the monsoon broke earlier than usual, for she was unable to cross the Bay of Bengal and was forced to wait until the next sailing season, being delayed in all ten months. This is an excellent example of the dominance of the monsoons over navigation across the Bay of Bengal. This boat, the *Loyal Captain* was regularly employed in voyages between Madras and Syriam; her captain, Armiger Gostlin, was an experienced seaman, who had crossed the Bay on many occasions, and yet by starting from Syriam probably only a few days too late, she was delayed for 10 months. One is forced to conclude that the overhead expenses of carrying on this trade between India and Burma must have been enormous, and although we hear that the merchants engaged in it made gross profits of about 300 per cent. these must have been largely swallowed up by the cost of maintaining ships and sailors idle for so long in Burmese ports.

In the 16th century foreign ships coming to trade in Burma put in at either Martaban, Syriam or a port called by contemporary writers Cosmin, and identified by most modern writers with Bassein. Caesar Fredericke coming up the coast of Tenasserim naturally entered Burma by way of Martaban. But the journey to Pegu by the Sittang river was even then (1569) a most unpleasant one owing to the silting up of the river. He graphically describes the way boats bound for Pegu were forced to catch the "bore" in order to get through the narrow channel to the city—a somewhat dangerous proceeding.

37. Dalrymple, *op. cit.*, II, pp. 355—389.

"And in this voyage you shall have a Macareo, which is one of the most marvellous things in the world that Nature hath wrought, and I never saw any thing so hard to bee beleaved as this, to wit, the great encreasing and diminishing of the water there at one push or instant, and the horrible Earth-quake and great noise that the Macareo maketh where it commeth. Wee departed from Martaban in Barkes, which are like to our Pilot-Boats, with the encrease of the water, and they goe as swift as an Arrow out of a Bowe so long as the Tide runneth with them, and when the water is at the highest, then they draw themselves out of the channell towards some banke, and there they come to anchor, and when the water is diminished, then they rest on drie land: and when the Barkes rest drie, they are as high from the bottome of the channell, as any house top is high from the ground. They let their Barkes lie so high for this respect, that if there should any ship rest or ride in the channell, with such force commeth in the water, that it would overthrow ship or Barke: yet for all this, that the Barkes be so farre out of the channell, and though the water hath lost her greatest strength and furie before it come so high, yet they make fast their Prow to the streame, and oftentimes it maketh them very fearfull, and if the anchor did not hold her Prow up by strength, shee should be over throwne and lost with men and goods. When the water beginneth to encrease, it maketh such a noise, and so great, that you woulde thinke it an earth-quake, and presently at the first it maketh three waves. So that the first washeth over the Barke, from stemme to sterne, the second is not so furious as the first, and the third raiseth the anchor, and then for the space of sixe hours while the water encreaseth, they rowe with such swiftnesse that you would think they did flie: in these tides there must be lost no jot of time, for if you arrive not at the stagions before the Tide bee spent, you must turne backe from whence you came."³⁸

Ralph Fitch coming to Burma from Bengal landed at Cosmin. He describes it thus: "The Land is very high that we fall withall; but after we be entered the Barre, it is very lowe and full of Rivers, for they (the inhabitants) goe all to and fro in Boats, which they call Paroes, and keepe their houses with wife and children in them." He then goes on to relate how he journeyed from Cosmin to Pegu in one of these, "Paroes" passing by Dalla and Syriam on the way. Dalla, he says, "is a very faire Towne, and hath a faire Port into the Sea, from whence go many ships to Malacca, Mecca and many other places." Syriam was "a good Towne, and hath a faire port into the se, whither come many ships from Mecca, Malacca, and Sumatra, and from divers other places. And there the ships stay and discharge, and send up their goods in Paroes to Pegu."

38. Purchas, Maclehose Reprint X, pp. 119—120.

39. *Ibid.* X, p. 186.

CONDITIONS OF TRADE IN BURMA IN THE 17TH CENTURY.

In earlier days before the silting up of the river, the city of Pegu had been a sea-port, but towards the end of the 16th century sea-borne traffic could no longer make her harbour and ships had to unlade their goods at Syriam and transfer those destined for Pegu into river vessels. With the beginning of the 17th century Cosmin too lost its importance as a port, partly owing to the terrible devastation of the Delta region due to Nanda Bayin's disastrous foreign policy, and partly through the prominence given to Syriam by Felipe de Brito's occupation of it during the years 1599—1613. De Brito's ships blockaded the coast of Lower Burma and forced all external commerce to pass through Syriam. Throughout the 17th century the importance of Syriam completely overshadowed that of either Martaban or Cosmin. All the English trade and nearly all the Dutch trade to Burma passed through Syriam. Occasionally we hear of Martaban being used for smuggling such goods as tin and ivory out of the country; export of these commodities was sometimes forbidden by the Burmese government, as has been previously related.

Possessing few ports Burma could and did maintain a strict customs system. Its rigour vastly impressed Caesar Fredericke. Ships from St. Thome and Bengal, he said, usually discharged their cargoes at Cosmin "whither the customers of Pegu come to take the note and markes of all the goods of every man, and take the charge of the goods on them, and convey them to Pegu, into the King's house, wherein they make the Custome of the merchandise, when the Customers have taken the charge of the goods, and put them into Barkes, the Retor of the Citie giveth licence to the Merchants to take barke, and goe up to Pegu with their merchandise; and so three or foure of them take a Barke and goe up to Pegu in companie. God deliver every man that he give not a wrong note, and entrie, or thinke to steale any Custome: for if they doe, for the least trifle that is, he is utterly undone, for the king doeth take it for a most great affront to bee deceived of his Custome; and therefore they make diligent searches, three times at the lading and unlading of the goods, and at the taking of them a land."⁴⁰

The East India Company's factors who opened the first English factory at Syriam have a similar tale to tell. Their profits on sales, they said, were good, but offset by the high customs duties, "which will amount to neare 16½ per cent., and that required in spetia, with more strictness then wee have ever seene in any other place". Besides the severity of the customs administration—which, however, could be mitigated by judicious though heavy bribes—we notice another interesting feature of Burmese policy: the names of all foreigners entering the country were carefully registered and no man could depart the country without special permission. When Forrest and Staveley arrived at Syriam in 1617 they were met by two officials sent by the myosa to record in writing their

40. *Ibid*, X, p. 129.

names, ages and the cause of their coming to Burma.⁴¹ The reason for this was somewhat disconcerting to them: "for what men soever come into his country, he holds them but as his slaves, neyther can any man go out of his Country without his leave, for hee hath watch both by Land and Water." Ships not actually bound for Burma but forced by stress of weather or lack of provisions to put into Burmese ports were liable to seizure by the government. Their cargoes would be confiscated and their crews forcibly detained in the country.

These customs were ironically commented upon in his "New Account of the East Indies," by Captain Alexander Hamilton who visited Syriam in 1709. "When any foreign ships arrive at Syriam," he wrote, "the number of people on board, with their age and sex, are sent to him (*i.e.*, the King of Burma) to let him know that so many of his slaves are arrived to partake of the Glory and Happiness of his reign and Favour. . . . If a stranger has the misfortune to be ship-wrecked on their Coast, by the Laws of the Country, the Men are the King's slaves."⁴² The chief object of Edward Fleetwood's mission to Ava in 1695 was to secure the release of a Madras merchant named Batholomew Rodriguez whose ship had been forced to put in to Martaban for want of wood and water and had been seized with all she carried, both crew and cargo, by the Burmese royal officials.⁴³ Hamilton relates that the hpoongyis would often intercede for a shipwrecked mariner and secure his release. In writing of this matter he pay such a striking tribute to the humanity and hospitality of the old-time Buddhist priesthood of Burma that I cannot refrain from quoting it in full: "When the unfortunate strangers (*i.e.*, shipwrecked mariners) come to their Baws, they find a great deal of hospitality, both in food and raiment, and have letters of recommendation from the Priests of one Convent to those of another on the road they design to travel, where they may expect vessels to transport them to Syriam; and if any be sick or maim'd, the Priests, who are the Peguers chief Physicians, keep them in their Convent, till they are cured, and then furnish them with letters, as is above observed, for they never enquire which way a stranger worships God, but if he is human, he is the object of their charity."⁴⁴

Apparently it was a long-established Burmese custom to provide with wives all foreigners who were forced to make a protracted stay in the country either by shipwreck or for commercial reasons. The custom was commented upon by Linschoten in the 16th century.⁴⁵ No foreigner on leaving the country, however, might take away with him either his Burmese consort or her children. Probably many of the English traders and sailors who frequented Syriam in the 17th century

41. See *ante*, Chapter II.

42. Hamilton "A New Account of the East Indies (1727 Ed.) II, pp. 46, 62.

43. Dalrymple, *op. cit.*, II, pp. 337—9. Factory Records Misc. Vol. 18, ff. 23—25.

44. Hamilton, *op. cit.*, II, pp. 62—3.

45. Linschoten J. H. "Voyage to the East Indies" I, p. 98.

CONDITIONS OF TRADE IN BURMA IN THE 17TH CENTURY.

made alliances of this kind. The Fort St. George records of the year 1655 contain a reference to this custom.⁴⁶ It would seem that Thomas Bland, a sea-captain whose employment on voyages to Burma by the Company we have already noted,⁴⁷ had a real wife in Madras and a temporary Burmese wife in Syriam. The real wife is said to have wished to accompany her husband to Syriam and to have been with difficulty, persuaded from so doing on the grounds that the Burmese wife would poison her if she put in an appearance at Syriam. Martin Bradgate was responsible for this imputation against the character of the Burmese lady in question, and Thomas Howard is reported in the same document to have said "that when he was at Madraspatam that if any one carried his wife to Pegue, that had kept another in Pegue, she would certainly be the death of her."

The persistence of this custom into the 18th century was noted by Hamilton whose observations thereon are of sufficient interest to be quoted. "The Women," he wrote, "are very courteous and kind to strangers, and are very fond of marrying with Europeans, and most part of the strangers who trade thither, marry a wife for the term they stay."⁴⁸ Referring to the product of these mixed marriages he continued: "the children cannot be carried out of the kingdom without the King's Permission, but that may be purchased for 40 or 50 L sterl. and if an irreconcilable quarrel happen where there are children, the Father is obliged to take care of the Boys, and the Mother of the Girls. If a Husband is content to continue the Marriage, whilst he goes to foreign Countries about his Affairs, he must have some Fund to pay her about six shillings eight pence *per* Month, otherwise at the year's end she may marry again, but if that sum is paid her on his Account, she is obliged to stay the Term of three years, and she is never the worse, but rather the better lookt on, that she has been married to several European Husbands."⁴⁹

It must by now be obvious to the reader that the general failure of the great European companies of commerce to develop a permanent settled trade with Burma was mainly due to the high cost of maintaining a factory in the country combined with the general inaccessibility of the resources of the country for trading purposes on a large scale. Royal policy and the customs of the country doubtless contributed their share in augmenting this latter difficulty to a somewhat abnormal degree.

We are therefore forced to the conclusion that although certain Burmese commodities strongly attracted the foreign trader, trade with Burma on a big scale was not a paying proposition in the 17th century. This will be all the more obvious when we study the attempts made at the end of the century to re-open an English factory in Syriam.

46. Factory Records, Fort St. George Vol. I. p. 3.

47. *Ante* Chapter III. p. 35 and note 58.

48. Hamilton, *op. cit.* II, p. 51.

49. *Ibid.*, pp. 52-3.

CHAPTER VI.

Sir Streynsham Master's Attempt to Re-open English Trade with Burma in 1680. *

In 1676 the Dutch East India Company's Council at Batavia decided to close its trading station in Burma. The cause of this step is somewhat obscure: probably the Dutch like their English competitors, found that the maintenance of a permanent factory in Burma was not a sufficiently paying proposition. Dalrymple's wild assertion that the Dutch, and with them the English, were expelled from Burma because the former "threatened (if they did not even attempt) to bring in the Chinese," cannot be accepted; but there seems to have been some dispute between the Dutch and the Court of Ava over the question of a proposed Dutch trading station, presumably at Bhamo, for exploiting the trade between Burma and China. In this connexion two entries in the Diary of Sir Streynsham Master, made in January 1680, are illuminating. In the first he reports having seen a small Dutch ship and sloop off Narsapore which were "bringing all their Factory from Pegu". In the second he explains that the Dutch withdrawal from Burma was "because the King would not permit them to settle a Factory upon the borders of his Kingdome next China and to be custome free".

The departure of the Dutch from Burma coincided with a revival of interest in the Burmese trade on the part of the Directors of the English East India Company greater than at any time since the closing of the old Syriam factory in 1657. A strong demand had arisen for two important Burmese commodities—sticklac, (*i.e.*, lac in its raw condition when first taken from the tree) and saltpetre. The demand for Burmese lac recurs constantly in the Company's general despatches to Fort St. George in the latter half of the 17th century. In the seventies the usual request is for not less than one hundred tons a year; it is listed as "best Pegu Sticklack, black". Evidently the Burma variety was still considered superior to the Indian, as it had been earlier in the century, since in the General Letter from the Court of Committees to the Hugli factory dated the 24th February, 1675, the following directions are given: "And if you cannot procure the full quantity of Black Pegu Sticklack, then you are to make it up with the best and blackest of such Sticklack as is procurable in the Bay, and Lett it not be shott but sent home in Bales". In 1680 the Agent-Governor and Council of Fort St. George were ordered to increase their next year's cargo of Burmese lac, if possible, by fifty tons.

Saltpetre was an important item in the East India Company's trade, being not only in constant demand for the manufacture of gunpowder, but of great use as ballast in ships returning homewards from the East. Probably, however, the Company's chief anxiety to procure supplies of saltpetre from Burma was dictated by the necessity for arming and fortifying its stations on the mainland of India against the Marathas. Under

*Paper read at the annual meeting of the Burma Research Society on Friday, February 25th, 1927.

their brilliant leader, Sivaji, the Marathas had, during the past decade and more, proved themselves a serious danger to the English factories in India. After a series of attacks upon the western stations which culminated with the capture of Surat in 1677, Sivaji made a great incursion into southern India in that year and actually threatened Madras. In the following year Madras was barely saved from plunder by a Maratha reverse in Mysore. The Directors at home, not realising the gravity of the situation and the inability of the Mogul power to protect the English traders, were unwilling to incur the expense of fortifying the Companies' factories. But, notwithstanding opposition at home, the work of fortification was undertaken by responsible men on the spot, and feverish attempts were made to put the threatened stations in as defensible a state as might be.

The special demand for these two commodities, coming at the time of the Dutch withdrawal from Burma, led the Fort St. George Council to debate the possibility of reopening the old Syriam factory and planting other trading stations in Burma. It happened that at this time the direction of affairs at Madras was in the energetic hands of Sir Streynsham Master, who was appointed Agent-Governor there in 1677 in succession to Sir William Langhorne. Master had had a long and distinguished career in the service of the Company. His excellent financial work at Surat between 1660 and 1671 had earned for him much praise, while his behaviour on the occasion of Sivaji's attack upon Surat in 1670 had won the thanks of the Directors and a gold medal. Such was the man who in 1680 reopened negotiations between Fort St. George and the Court of Ava.

The form and method of the negotiations were decided upon by the Fort St. George Council at a consultation held on February 23, 1680. It was decided to entrust a Portuguese inhabitant of Madras named Joan Perera de Faria Junior, who knew Burma well, with a commission to treat with the King of Ava concerning eighteen articles of trade that were drawn up by the Council. In the minutes of this meeting the causes of the move are stated to have been the Company's special demands for saltpetre and lac, and the hope of establishing a successful trade with Burma, in view of the recent withdrawal of the Dutch.

In return for his services in negotiating the treaty, if it were successfully carried though, Joan Perera was to receive one half of the difference between the customs duties actually paid on the first full shipment of English goods to Syriam after the treaty should come into effect, and the usual rate of duties levied at the Burmese port. It was stated that the normal Burmese customs amounted to "14 per cent. taken in specie and $2\frac{1}{2}$ per cent. in mony for the Queene after sale of the Remainder of the goods which together is about $16\frac{1}{8}$ per cent." As Master was asking for a reduction of Burmese customs duties on British goods to 5 per cent. it was hoped that $11\frac{1}{8}$ per cent. would thereby be saved. The Council

therefore expressly stated that the moiety of this $11\frac{1}{8}$ per cent. "or soe much as shall be saved by virtue of the Kings concession upon this Treaty, upon the whole cargo only of the first ship of the Companys that shall arrive at Sirian after the conclusion of the Treaty," should be paid to Joan Perera "in consideration of his care and charge in negotiating the said Treaty". He was also to be allowed the sum of thirty pagodas towards his expenses and especially for the purpose of having the Articles translated "into Barma language". At a later consultation held on March 1st of the same year it was decided to give Joan Perera powers to take possession of the Company's ground and houses in Syriam and Ava.

In his instructions to the Portuguese envoy Master advised him to inform his Burmese Majesty that under the privileges granted to the Company by the Mogul power the import and export of all goods duty free without examination was allowed; that the Company was absolved from the burden of making presents to the Mogul and of sending ambassadors to his court. Moreover, he was to hint that the obstacles placed in the way of trade by the Burmese government were the chief cause of the Company's earlier abandonment of its trading stations in the country. If it were possible to get cheap supplies of saltpetre, Master expressed the hope that the Burmese government would allow the Company to employ native labour in its manufacture, and to export any quantity of it that might be necessary as ballast for ships homeward bound, "and for our Kings want of it by reason of the great expence of Powder in his Sea Warrs with his neighbours". What above all was required was "such a freedom and liberty for our ffactorys and ships, as may not discourage our people, for," continued the instructions, "we have forsaken many profitable Trades by reason of the inconveniences that attend an over-strict and severe usage, which is altogether needless to the English, who are a friendly and true People to what they promise as they have aproved themselves at all times, and upon the Acctt that they are so acceptable to all Princes in those places where they have any trade their privileges are greater than any other European Nation".

The proposed articles of commerce are of great interest not only in throwing light upon the peculiar trading conditions experienced by foreign merchants in Burma, but also as giving us an idea of the sort of conditions deemed necessary for successful trading in the East in those days. Unfortunately time does not permit of my reading them to you in full: I must content myself with giving you a bare summary of them. They are entitled "Articles of Commerce to be proposed to the King of Barma and Pegu in behalfe of the English Nation for the settling of a trade in those Countreys." By the first permission was asked for the English to have free access to, and egress from Burma to "sell, buy, and barter according to the Custome of the Country." By the second, the Company petitioned that all goods sold to, or bought from, the King of Burma by the English should be free from customs duties; goods sold to merchants of the country were to be liable to customs duties at the rate of 5 per cent.

only, while nothing was to be paid on goods exported from the country, and in this connexion gold, silver, rubies, timber, rice, and provisions are specially named. By the third article, customs were not to be paid on unsold goods taken out of the country within six months of importation. Customs duties were to be paid in gansa, the current money of the country, and not in specie, and the customs officials were not to open all the bales of goods for inspection but only one in every ten. By the fourth, goods belonging to other merchants and carried in English ships to Burma were to be rated at only half of the usual customs duties. By the fifth, the English were to be granted permission to plant factories at Syriam and Ava either on their old or upon new ground, and at Martaban, if they so desired. They were to be allowed to build warehouses of brick or stone for the better preservation of their goods, and should be free from molestation in their factories. By the sixth they were to be allowed to buy or make saltpetre and indigo in any part of the country on condition that they undertook not to dispose of the former to the inhabitants of the country, but carried it straight to one of their factories in India. By the seventh, general permission was sought for all English ships to depart from Burma freely without having to await special permission from Ava. The eighth dealt with cases of shipwreck. In such cases it was laid down that the Burmese officials should give all possible assistance to save ships and prevent embezzlement of salvaged goods and that shipwrecked crews should be allowed to go free. By the ninth article, the right of the English to dispose of the estates of deceased English merchants was claimed: the Burmese Government was to give up its customary right to attach such estates. By the tenth, offences committed by the English were to be "punished and accommodated by the Chief of the English." In cases of wrong committed against the English by Burmans, if justice were not immediately done by the royal officials, appeal should lie directly to the king himself, and the English should be free from the liability to pay the usual ten per cent. court fees. The eleventh laid down that the Burmese Government should refuse employment to all English deserters: a request doubtless inspired by the Company's recent experience in Siam.

By the twelfth, the English were to enjoy the free exercise of their religion within their factories. By the thirteenth, the English sought the support of the Burmese Government for collecting bad debts owed by inhabitants of the country, "and in default thereof the English shall and may take and keepe such persons as prisoners in their houses until satisfaction be made them"; so this article continues. By the fourteenth, royal protection against robbery or violence was sought. The fifteenth laid it down that on the arrival or departure of English ships no presents were to be made to the Governor of the port, and that lower fees were to be charged by the royal officers accompanying boats between Ava and Syriam. By the sixteenth, the English were to have "the dispose of the children which they may have by the women the natives of the Country, to carry or send the same children out of the Country at

their pleasure notwithstanding the lawes of the Country." By the seventeenth most-favoured-nation privileges were sought, and lastly by the eighteenth the issue of royal orders to all officials in Burma enjoining upon them the strict observance of the articles, was requested. The final draft of these articles bears the signature of Sir Streynsham Master.

The first and most striking feature of these articles of commerce is their close application to the peculiar trading conditions experienced by previous English merchants in Burma: they constitute a sort of commentary upon the relations between the Company's servants and the Government of Burma. Point by point they deal with the special disabilities to which foreign merchants were subjected through Burmese governmental practice or popular custom: the high rate of customs duties, the extraordinary restrictions imposed upon foreigners in regard to departure from the country and the disposal of their children by Burmese mothers, the harsh treatment of shipwrecked mariners and the vexatious system of presents to all officials from the highest to the lowest.

The special powers, asked for by Master in order to enforce the payment of debts and the performance of contracts on the part of Burmese merchants, refer to an old Burmese custom noted by both Caesar Fredericke and Ralph Fitch in connexion with the Burmese system of brokerage. It shall be described in the words of the latter. "If the Broker pay you not at his day," he writes, "you may take him home, and keepe him in your house: which is a great shame for him. And if he pay you not presently, you may take his wife and children and his slaves, and binde them at your doore, and sette them in the sunne; for that is the Law of the Country." All foreign traders in Burma had to sell their goods through these brokers. Article 15 should be read in the light of the list of goods consigned to Edward Fleetwood and James Lesly for presents to the King of Burma and the various officials, both high and low, on the occasion of their embassy to Ava in 1695, the documents relative to which are given in the second volume of Dalrymple's *Oriental Repertory*. They were valued at no less a sum than 998 pagodas, or nearly £400 sterling. The reference in this article to the royal officials whose duty it was to accompany merchants travelling by water between Ava and Syriam is interesting, since it leads one to conjecture whether Burmese suspicion of the foreigner, or the semi-independent condition of the royal vassals, was the cause of this proceeding. There is ample evidence from Burmese sources to show that the Burmese government in the 17th century maintained strict control over the riverine communications between Syriam and the capital.

In surveying these articles we must not allow our knowledge of what the Company ultimately developed into at the end of the next century to affect our interpretation of their spirit. There is no sign of any aggressive or imperialistic aim in them. How could there be? Threatened

by the Marathas, by the Mogul viceroy of Bengal and by any petty rajah strong enough to blockade one of its stations ; assailed by bitter criticism at home on the part of rivals such as the Levant Company and the big textile manufacturers, who feared the effects of the import of Indian piece-goods upon their industry, the Company, notwithstanding its financial prosperity and the support of Charles II, was in no position to dictate unequal trading terms to any Eastern potentate. The Company doubted the possibility of conducting successful trade with Burma. These terms therefore were regarded by the Fort St. George Agent-Governor and Council as the only reasonable conditions upon which organised trade could be reopened. Far were they from constituting any attempt to secure either unfair commercial advantages or anything of the nature of political influence in the country. And it must be remembered that the privileges of freedom of access to, and egress from, the country, remission of a portion of the customs duties, and exemption from the obligation of giving presents and of maintaining agents at the court, were no more than were actually conceded to the Company by the Moguls in respect of its trade in India.

At the same time as this commission was granted to Joan Perera, the Fort St. George authorities decided to issue a *cowle* or "letter of promise of kind usage" inviting "Pegu ruby merchants" to bring their stones for sale in Madras. The Armenians were apparently strongly entrenched in this trade. Evidently this was an attempt to divert into English hands the long-standing trade in rubies between the Coromandel Coast and Burma. Duarte Barbosa refers to this trade early in the 16th century. According to him the merchants of Pullicat bartered coloured cotton stuffs of Indian make for rubies and spinells "of good quality" in Burma. Masulipatam is said to have been the chief Indian centre of this trade in Streynsham Master's day. In his *cowle* it was set forth that ruby merchants from Pegu and Ava might freely bring precious stones, gold and silver in any form to Fort St. George. They were to pay no customs duties on arrival, but were merely to show and register their packages at the Choultry "without being obliged to open the seales." Only brokerage was to be paid on actual sales at the rate of $1\frac{1}{2}$ per cent., plus the Town Broker's fee of $\frac{1}{2}$ per cent. Unsold goods were to be freely carried away without payment of customs. In order that news of these concessions should be published as widely as possible, it was ordered that the *cowle* should be translated into Portuguese, "alsoe into Persian, the Gentue (Telugu) and Malabar (Tamil) Languages," and that copies should be sent to various places. It is significant that no mention is made of the necessity of translating it into Burmese. The "Pegu ruby merchants" were not Burmans. Few, if any, Burmans in those days left their country to carry on trade in foreign parts. What was the upshot of all these preparations for re-establishing English trade with Burma? On January 24 of the following year Joan Perera returned from Burma to Fort St. George with an answer from the King, which at a consultation held on that day,

was ordered by the Agent-Governor and Council to be translated into English and sent home to the Directors. I have been unable to discover any trace of this document ; we are left therefore to guess at its contents. This can, however, be done with some degree of certainty, since in a letter from the government of Burma received some years later at Fort St. George, which will be dealt with in due course, a reference was made to the answer entrusted to Perera. The Burmese government refused to bind itself to any written assurances. If the Company wished to trade with Burma, let it send its own representative to appear with presents before the golden feet, whereupon due favour and pity would be shown. Such was the substance of the reply.

Meanwhile the Directors at home on hearing of Master's project were thoroughly opposed to any settlement in Burma. In their despatch to Fort St. George dated January 5, 1681, they emphasized the fact that although they were particularly anxious to secure large supplies of Burmese lac, they had "no purpose at present to settle a trade at Pegu." Later on in the same letter they repeated their request for Burmese lac, and at the end of the letter, in the list of goods to be provided on the homeward shipping they included 150 tons of "Pegu Sticklack." A year later in a letter dated February 8, 1682, they reiterated their intention not to countenance the settlement of a factory in Burma. "Pegu Sticklack," they wrote, "we like well, procure and send us all you can thereof but we do not think it worth our charge to settle a factory there. We hope that you being persons that will study our interest and having so many Portugal and other merchants living under your government and some that trade to Pegu and Acheen contrive with and so encourage them, that they may in the course of their own trades bring to our town of Madras, benjamin and the commodities of Acheen and black Sticklack from Pegu, which you may buy of them at moderate rates and which may come much cheaper to us than by settling of factories in places of such small trade."

The most hopeful result of Joan Perera's visit to Burma was that he was accompanied back to Madras by a number of ruby merchants with considerable quantities of rubies, who promised to settle their trade there. Orders were issued to the customs officer that he should treat them with a special degree of civility in order to encourage more to come. Apparently the scheme was successful. The substitution of brokerage on actual sales for customs duties constituted treatment so much more liberal than these merchants received in other ports that large numbers of them were attracted to Madras. Sir Josiah Child in 1682 wrote to Fort St. George urging the Agent-Governor and Council to encourage and cultivate this trade, "which peradventure may cheapest be done by such of the Portuguese who you can confide in and that live under your protection," he wrote, "and by their means you may arrive at a large and constant supply of that black Pegu sticklack which we have so often designed and would be very serviceable to us." The extent of the development of this trade

NEGOTIATIONS WITH BURMA 1680—86.

from 1681 until the end of the century may be gauged from a despatch from the Directors to Fort St. George dated March 9, 1703, wherein the Burma trade is called "a considerable branch of the trade of that place" and, what is still more striking, is said to have caused Madras to have become the chief seat of trade with Burma on the Coromandel Coast, a position previously held by Masulipatam.

In 1683 the Company's resolution not to settle a factory in Burma was temporarily shaken. Probably as a result of the increase of trade in Burmese commodities in Madras, due to the influx of the ruby merchants, supplies of Burmese musk were obtained, and the Company sent instructions that this trade should be encouraged. Southern Burma had long been known to Europeans for its musk. "Here is all the musk in the world," wrote Alvaro Velho of Pegu in 1498, while another Portuguese observer in 1505 mentioned a ship from Pegu with a rich cargo of lac, benzoin and musk. Previous to 1683 the East India Company had procured most of its musk from Cochin China. Now the chance of obtaining supplies from a nearer source led Fort St. George once more to press the Directors at home to reconsider their decision against reopening the Syriam factory.

But the Directors' resolution was shaken not so much by the arguments of Fort St. George as by the extraordinary yarns about the rich profits to be derived from Burmese trade, that were pitched into the ears of James Duke of York by a renegade Dutchman named Spar, who had once been head of the Dutch factory in Burma. Our information concerning this episode is contained in two despatches sent by the Directors to Fort St. George in July and October, respectively, of the year 1683. I will quote their relevant portions verbatim.

The July one runs thus :

We see you still encourage the settlement of a factory at Pegu and suppose our Agent may remember that we formerly had a factory there, and in many other places, which we were forced afterwards to withdraw, because the trade did not maintain the charge of the factory presents etc., but we must confess we think the fault might not altogether be in the places, but in the men management and direction of them. Now we are so well satisfied that you will truly weigh and consider the cost with the conveniency for us as cordially as for your selves. We shall permit you to settle there in such manner and upon such terms as you shall think most for our advantage, and the rather because a disoblged Dutchman that was formerly many years chief of that place hath given us hyperbolical commendations of it. He saith (if he may be believed) he made 40 ton of gold profit there for the Dutch Company in a few years."

The October despatch contains a fuller account of Spar's statements. "There was lately here one Spar, that was formerly chief of the Dutch at Pegu. Some of us by his Royal Highness's direction have had discourse with him; he seems to be a knowing experienced but an ill-natured, boisterous, prating fellow, and therefore we thought not fit to trust him. He says Pegu after the loss of Bantam is the best place of India to build a fort at, to command our China trade, and that the paroes of Sumatra may easily and safely bring their pepper thither without hindrance of the Dutch. We told him there was nothing there besides sticklack towards the loading of a ship, though there be some rubies, gold, ambergreece and other fine goods, accidentally, and that the King of Pegu was a great and proud Prince and would not admit of building a fortification nor the trade of that place be worth it. But he abounded in his own sense and would be persuaded to no other. We have told you this story that being nearer and better acquainted with the place you may consider of it, through we think there is little encouragement in it, being much more remote from the pepper trade than Acheen; and give us your opinion thereof".

The reasoned wisdom of the Directors' replies to this prater is very striking. They realised clearly that the value of a trading station in Burma depended ultimately upon two factors: the commercial products of the country and the royal policy in relation to trade. Both of these were considered unfavourable to the development of a settled trade on the spot, and whatever hypothetical advantages Burma might afford in connexion with the trade of China and Sumatra were completely offset by these actual and already-experienced disadvantages.

Having been given an inch, the Fort St. George authorities proceeded to take an ell. In September 1684 it was decided to reopen negotiations with Ava through a certain Captain Peter Dod, master of the *Providence*, a private trading vessel plying between Madras and Syriam. Little information is forthcoming about Dod. In 1675 he was serving as mate of the *Recovery*, a private ship belonging to a certain Robert Fleetwood. Later on he is described as a free "mariner and inhabitant" of Masulipatam engaged in shipbuilding. Dod was instructed to use Sir Streynsham Master's Articles of Trade as the basis of his negotiations, but in addition he was asked especially to inquire into the possibilities of opening a station at Bhamo. Evidently the Dutchman's suggestion about making Burma an entrepot for overland trade with China was seriously considered. For many centuries the bulk of Burma's trade with China had passed along the Taping river, in earlier days through Kaungsin, until the importance of that place was overshadowed by Bhamo from the 15th century onwards. It is interesting that the Dutch idea of establishing a station at Bhamo, one of the chief causes of their withdrawal from Burma, should

having been passed on to the English by no less a person than the late chief of the Dutch factory at Syriam. Under the particular conditions of foreign trade in Burma, however, the idea was worthless.

Dod sailed for Burma on September 15, 1684, on board the *Prosperous*. On February 4 of the following year he returned to Fort St. George bringing with him two letters from an official styled in the Fort St. George Diary the "Chief Governor," but in the English translation of the only one now extant his title is given as the "Geakeadar." Probably he was no more than the local Sitkedaw of Syriam, the provincial head of police, through whom Dod may have conducted his negotiations without going in person to Ava. We have no proof that he went to Ava on this occasion, though he claimed (and received) the sum of 15 pagodas to defray the cost of sending a present to the King at Ava. It is significant that in the official entry of the sanction for this payment in the Consultation Book the word "send" is used.

The Sitkedaw's letter has on it neither name nor date, and the only copy of it now available is in the Madras Record Office in a seriously delapidated condition. As it is the only direct communication from a Burmese official to the East India Company in the 17th century now extant, it is of especial interest. But it also furnishes us with our only first-hand knowledge of the reception accorded by the Burmese authorities to Sir Streynsham Master's proposals. Its style is extremely crude and its grammar and spelling atrocious, even for the 17th century. One wonders who translated the original. The full text is as follows:—

"I Geakeadar by great lucke and continuall meriting and deserving of my person I bow my head constantly and under ye feet of God of ye great maty and my King and Lord, I do know and understand ye English superior, yt we have doe translate into Barmas Language yt letter wch he had sent us, out of wch we understand his desire for ye establishmt of Factories at Syam (Syriam), Pegu and Ava, item yt our subaltare Governours, ought to deliver ym a good traetment and respect, and by case our Chapmen buy some merchandize wares from ye English, and after yt did not pay ym, then he may oblige yt man to pay wt he debt to him, item if their ship suffers shipprack, may ye saved men return back again at their country without any hinder, item all goods of the deceased Englesman, may his owne people get it in their power, without any conitradiction and contrarity, concerning this 4 or 5 articles, we doubt not his approbation, as wn ye English superior will service his maty the King my Lord as is his obligation, and upon all ye other articles is not possible to grand approbation, but ye sayd superior will come or send somebody heare yn we will take our councell in such manner yt, we may move ye King to piety and I shall do all possible diligence in this matter.

Since ye time of ye predecessors of his maty till ye time of this our King is ye use to pay custome of each v () one and therefore men cannot say it must be so or so but as wn you appear before the gold feet of his maty and service him, yn may pray ym if he please to do this favour and grant leave for ye export of salpetter, likewise alsoe that yow may exercise yor Cristian duty in yor Factory, item wn the Engles have some pleadings against another that it may agree before themselfe or may apreseted before his maty ye king, item wn somebody owed to an English man and alsoe to another man, must pay first ye Englishman, item Children as well son as daughter, wch an Englishman may begett wth a woman of this country he may bring ym out of this place without any molest and hinder, item as when a ship come in heare he may depart hence again wn he please without takeing leave of ye Gover of this court, all this and the rest moor hath told us yt capt Jn Perera de farra, thereupon we answer its not convenient to propund all this question, but as well Englishman as other nation, that come hence and appear wth their present before the gold feet of our Royall Person and service them, and being servant then he may pray his maty to doe him some favour, and according his deserve he shall receive it and then we shall see wt is just to helpe you in such manner as shall be necessary."

It is significant that not one word is said about Bhamo. Nor do we find an further mention in the records of the project to establish a station there. Either Dod reported against it, or the Burmese refused to listen to the proposal. In any case the Directors at home had no faith in the scheme for establishing overland trade with China through Burma. Fort St. George was in no way discouraged by the flat refusal of the Burmese government to bind itself by definite articles of trade. It was decided to send Peter Dod once more to Burma "to discourse againe with the great men, about our Settlement there." On this occasion he sailed to Burma on the *Providence* shortly before the break of the wet monsoon of 1685. His second mission was like the first a failure. Returning to Madras in February 1686 he brought with him another letter, this time from the government at Ava. This, like so many of the records of the 17th century, is no longer extant, but its contents may be inferred from a remark in Dalrymple's *Oriental Repertory*. Evidently the Burmese Court did not think Dod a person of sufficient standing to negotiate on behalf of the East India Company, of which he was not even a member.

Poor Dod met with a tragic end. On March 25, 1686, when his ship, the *Providence*, was weighing anchor in Madras harbour for a return voyage to Burma, he was accidentally killed "by a Barr of the Capstern." By this time, however, the Directors had finally made up their minds not to settle a factory in Burma. The prospects of developing a satisfactory trade in musk were uncertain. "The pot of Pegu musk you sent us by the London," wrote the Directors to Fort St. George in

September 1684, "proved but indifferent; some cods very dry, and some falsified; at the price you paid for it, *vis.*, 25 Pagodas per catty, there is no profit on it. We used to pay for Tonquin cod-musk no more. However if you can't get it cheaper send us 1000 to 1500 oz. But if to be had at 20 pagodas per catty, you may send five to six thousand ounces: pray let great care be had to its goodness."

On the other hand adequate supplies of lac were forthcoming as a result of indirect trade, and the Directors were of opinion that without exceptionally good trading privileges in Burma the profits of the trade might be swallowed up by the cost of maintaining a factory there, and then, they wrote, "we do but rise to fall, and make a noise for nothing." So finally in August 1685 they once more sent out definite instructions that the project of establishing a factory in Burma was to be given up. "Pegu will never be a place for us, worth the charge of a factory," they wrote, "so we would have you proceed no further therein." These orders arrived in Madras some time in 1686, and there for the time being the matter ended. When next it was re-opened, it was the Court of Ava that took the initiative. But that is part of another story.

APPENDIX.

The following is a transcript of the more important entries in the Fort St. George Records relating to the Articles of Commerce with Burma proposed by Sir Streynsham Master in 1680.

Factory Records Fort St. George Vol. 2.

Diary and Consultation Book Jan. 26th, 1679-80—Jan. 10th 1680-18
Under A. folio 19 "Articles of Commerce to be proposed to the King of Barma and Pegu."

Folio 14.—16. Munday the 23 [February 1680].

At a Consultation.

Present :

Streynsham Master, Esq., Agent & Govn.
Mr. John Bridger.
Mr. Timothy Wilkes, Mr. Richard Mohun.

Upon consideration of the Hon'ble Companys Interest in relation to a trade to and from this place for Pegu, and also for settlement of Factorys and a trade in those Countreys for the procury of Saltpetre and Stick Lack as the Honble Company have apointed in the 9th section of their letter of 3rd January 1678 there being some probable hopes of succeeding therein (the Dutch having withdrawne their ffactorys thence) and there now offering a good opportunity of a Portuguer John Perera de Faria Junior Inhabitant of this place voyaging thither who is well experienced in those parts, It is thought fit and resolved to imploy the said Portuguer to treat with the King of Barma and Pegu upon Articles of Commerce for the settling a trade in his Countreys, and a Paper of Articles and also Commission and Instructions for the said John Perera to treat thereupon were now read, agreed upon and passed and ordered to be translated into Portuguez and ingrossed.

And it is agreed between the Agent Governour and Councell and the said Joan Perera de Faria Junior, that for and in consideration of his paines and charges in negotiating these Capitulations with the King of Barma and Pegu, when the said treaty shall be effected and the Companys Ships doe thereupon proceed and voyage unto Pegu, that the said Joan Perera his Heirs and Assigns shall have the Moyety or one halfe of the benefits arising out of the Customes of Serian upon the whole Cargoe of the first ship of the Companys that shall arrive at Serian, that is to say whereas the Customes of that place are 14 per cent. taken in spetie and $2\frac{1}{2}$ per cent. in mony for the Queene after sale of the Remainder of the goods which together is about $16\frac{1}{8}$ per cent. now if the King shall grant the English a trade paying in all but 5 per cent. Customes as is proposed in the Articles delivered to Joan Perera, then there will be about $11\frac{1}{8}$ per cent. saved in the Customes, the Moyety of which $11\frac{1}{8}$ per cent. (or soe much as shall be saved by virtue of the Kings concession upon this Treaty) upon the whole cargo only of the first ship of the Companys that shall arrive at Serian after conclusion of the Treaty, shall there at Serian be paid and made good to the said Joan Perera his Heirs, Executors or Assignes for and in consideration of his care and charge in negotiating the said Treaty, and nothing more or further shall be demanded or pretended by him, his Heirs, Executors or Assignes afterward upon Acctt of that service, or for any charge or Expense thereupon, saving 30 Pagodas which the Agent and Councell doe promise to pay and allow for the charges of translating the Articles into Barma Language, and other such necessary charges, soe the same be begun and proposed whether the treaty take effect or not, but not more, all other charges above the said 30 Pags. being to be born by Sinr. Joan Perera whether the treaty take effect or not.

Also the Marchants of Pegu having desired a Cowle or Letter of promise of kind usage to bring their Rubies from Pegu to this Port, It is thought fit to gratifie them therein, and accordingly such a forme of a Cowle was read and passed, and ordered to be translated into Portuguez,

alsoe into Persian, the Gentue and Mallabar Languages, sealed with the Companys seale and sent to divers places in severall copys.

(Signed) STREYNESHAM MASTER.
JOSEPH HYNMERS.
JOHN BRIDGES.
TIMOTHY WILKES.
RICHARD MOHUN.

(See :—Dalrymple : Oriental Rep. I, p. 102.)

Folio 17—18.

Commission and Instructions given by Streynsham Master Esq. Agent for the English Nation upon the Coast of Chormandell and in the Bay of Bengale and Governour of Fort St. George Madraspatam, by and with the advice of his Councell unto Joan Perera de Faria Junior to treat with his Majesty the King of Barma and Pegu concerning Articles of Commerce to be obtained for the English Nation for the settling a trade in those Countrys.

Sin^r. Joan Perera de Faria Junior,

Having confidence in your ability, industry and integrity in the managing of an affair of that Importance, I doe herewith deliver you a paper or draft of Articles of Commerce upon which I doe hereby impower you to treat with his Majesty the King of Barma and Pegu using your best endeavours to obtaine that the same may be granted by his said Majesty unto the English Nation for the settling of ffactorys and a lasting trade within his Dominions and under his protection which may Redound as much or more to the benefit of his Majesty and his Countrys then to the English themselves who seeke it, for there is noe nation with whom we trade but they find great advantage, satisfaction and content in our Commerce and conversation in soe much as that in all our ffactorys under this Agency upon the Coast within the Kingdome of Gulcondah, and alsoe in all those in Orisa and Bengale under the great Mogull we are not only free from paying all manner of Customes and Dutys (which is more then the Dutch can obtain) upon all our goods and marchandize as they pass in or out or to any ports within land, but also from being obliged to present the said Kings with any Presents, or to send any persons in the quality of Ambassadors or Agents to their Courts, and we doe enjoy many other great priviledges in these countrys for the better and more easy carrying on of our trade and affairs, as that our goods are at noe place denyed passage without being opened, examined or in the least hindered, our ships never looked into, nor any question made to impede their departure, and many other such like privileges as is very well knowne

to all people, which we doe enjoy as freely in them ports as in this our owne government, and it was the trouble we suffered under the government in Pegu which caused us to Relinquish our trade in that Country heretofore, but now hoping to obtaine some better encouragement we offer at a new settlement, and if the King shall thinke fit to concede to what we propose, he will certainly find advantage in it, if not we are still friends as we were before.

The great business will be upon the prizes of the goods, that they may be at such moderate rates that we may be able to hold the trade, also for Saltpetre, for liberty to make it and transport it, if that may be had cheap, and we may be free to imploy the natives to make it for us, and to export it in such quantity as we shall require it will much encourage us for supply of Ballast for our Europe ships, and for our Kings want of it by reason of the great expence of Powder in his Sea Warrs with his Neighbours. The next thing is how to supply mony or goods to pay for those goods we shall carry out of the Country, and the last and most needfull to continue our Commerce is such a freedom and liberty for our ffactorys and ships, as may not discourage our People, for we have forsaken many profitable Trades by reason of the inconveniences that attend an overstrict and severe usage, which is altogether needless to the English, who are a friendly and true People to what they promise as they have aproved themselves at all times, and upon the Acc^{tt}. that they are soe acceptable to all Princes in those places where they have any trade their priviledges are greater then any other European Nation, having represented these things to his Majesty and his Ministers as you shall find fit and convenient, I desire you to give me advice of your success therein, and of what further you shall find necessary in relation to this affair, and upon Receipt thereof you shall receive a definite answer from me, and soe God keepe you, dated in ffort St. George Madraspatam the 23rd day of February 1679-80.

STREYNHAM MASTER.

Folio 19-23.

Articles of Commerce to be proposed to the King of Barma and Pegu in behalfe of the English Nation for the settling of a trade in those Countreys.

1. That the English with their Ships and Merchandize may freely come into the country and Kingdome of Barma and Pegu there reside in safety, be treated with Civillity and Respect, and none of the King's Governours or Ministers or any others suffered to hinder or molest them or their servants, or any belonging unto them, but that they may voyage to and fro at their pleasure in persuance of their trade, sell, buy, and barter according to the Custome of the Country, and as shall be conceded unto these articles without any let or hindrance from the Governours or other the Kings Ministers they may tarry there as long as they think good and depart the Country again when they please.

2. That for and upon all goods and merchandize which the English sell, buy or barter to and with his Majesty the King of Barma and Pegu noe manner of Custome or other duties shall be paid either for importation or exportation of the same, and for and upon all goods and merchandize which the English shall sell, buy or barter to and with the Merchants or Natives of the Country they shall pay but 5 per cent. custome upon the goods imported only and nothing upon goods Exported, and for Silver, Gold, Rubies, Timber, Rice and Provisions of all sorts, no Custome is to be paid in or out.

3. That no Customes shall be paid upon goods which are not sold there, but after six months the English may freely carry the same goods away againe, or pay the five per cent. Customes, which five per cent. to be paid for Customes is to be paid in the currant money of the Country and not in spetie, the goods to be valued at 5 per cent. under the Bazar rate, and in regard it is very inconvenient and prejudiciall to have every parcel of goods opened therefore the English shall give in a list of all their goods, and the officers of the Customes shall if they please only open one parcell of ten chusing which parcells they please.

4. That all the goods which are carryed in the Ships belonging to the English shall pay but halfe the Customes usually paid in the Country although the said goods doe not belong to the English but to Marchants that lade the goods upon freight.

5. That the English may settle ffactorys at Serian Pegu and Ava, and have their old or new ground gratis apointed them by the King and may build them houses and warehouses of Brick or Stone to preserve their goods, and when they shall depart the Country may sell and dispose thereof to their best advantage and alsoe that they may settle a ffactory in like manner at Martavan and send their ships there if they shall think it convenient, and their houses may not at any time be forced or entered into by armed men by vyolence.

6. That the English may freely buy or make Saltpetre and Indico in any parts of the Country, paying the Natives hire for their labour, and export the same in such quantitys as they please, alsoe Lack and all other Commoditys which the Country produces they may export, they promising and obliging themselves not to sell or dispose of any Saltpetre to any other People, but to carry it bona fide to Madraspatam or some other their ffactories in India.

7. To prevent delays in the Despatch of their ships, it shall be permitted them at all times to depart from the Port when the English shall despatch them without attending of orders or license from Ava as hath been accustomed.

8. In case any Rack of Ship or Vessell belonging to the English shall happen in the Kings Dominions (which God forbid) the Kings Ministers and all his subjects shall be obliged to use all meanes possible to save the ship, goods, men and whatsoever else belonging unto them, to restore whatsoever shall be saved, and to prevent all manner of Imbezlement, and to let the Persons goe free with the same.

9. In case of the Mortality of any of the English, the goods and estate of the Deceased shall be at the dispose of the surviving English according to their manner, and the Kings Ministers shall not intermeddle therein.

10. Offences committed by any of the English shall be punished and accomodated by the Chief of the English and in case any abuse be offered to the English by any of the Kings subjects or others not in the English service, the Kings Governours or Ministers shall doe them present Justice, and the English shall not be obliged to apeale to any Court of Judicature, but only to the King himselfe for the ending of any controversy that may arise, and they shall be free from paying the Acock or 10 per cent. fees or any other fees in law sutes.

11. In case any of the English or any other in their Employment shall disert their service and fly unto the King or his Ministers or to any others for service or protection, it shall not be lafull to detain them, but the said person or persons shall be delivered up to the Chief of the English Nation and none of the Kings Ministers may intermeddle in matters which happen between one Englishman and another, or any that serve the English, without the consent of both partys and the Chiefe of the English.

12. That the English may freely exercise the use of the Christian Religion within their ffactorys without any molestation, and if any shall deride or disturb them therein, they are to be punished for soe doing.

13. In case any marchant of the Country shall be indebted to the English or shall refuse or neglect to comply with any agreement made with the English, the Kings Ministers shall use meanes to force every such Person to performe his agreement, and in default thereof the English shall and may take and keepe such Persons as prisoners in their houses until satisfaction be made them, and if any Person be indebted to others besides the English, the Debt which he oweth to the English shall be first satisfied.

14. In case any of the English houses or warehouses shall be robbed or plundered, or any their goods or monys forceably taken from them, or their Persons carryed Captive within any of the Kings Dominions by the Kings Vassalls or Subjects, the Kings Majesty is obliged to make Restitution and satisfaction to the English both for the estate and the persons so robbed, or plundered or Captivated.

15. That the English shall not be obliged to give any Presents to the Governours either at the Arivall or at the Despatch of their ships, and what is usually paid to those officers of the Kings which doe use to accompany the boates between Ava and Serian, shall be settled at more moderate rates than heretofore.

16. That the English may freely have the disposure of the children which they may have by the women the Natives of the Country to carry or send the same children out of the country, at their pleasure notwithstanding the lawes of the Country.

17. If the King shall hereafter grant any more or other priviledges to any other Nation then what are comprehended in these Articles, the same priviledges are to be granted to the English.

18. Lastly that the King shall issue out his Phyrmaund or Letters of Command to all his Governours, Officers and Ministers of what quality soever, strictly charging and commanding them under severe penaltys to observe these Articles of agreement with the English Nation upon all occasions whatsoever.

STREYNESHAM MASTER.

Folio 23-24.

A Cowle granted by the Right Worth Streynsham Master Esq., Agent and Governour of Affairs of the Hon^{ble} English East India Comp^a in ffort St. George Chinapatam by and with the advice of his Councell to all the Pegu Ruby Marchants.

That all whatsoever Marchants from Pegu or Ava that shall desire to come to this place upon any ship or vessell belonging to this Towne, or upon any other vessells, and shall bring their bulses of Rubys, they shall only shew and register them at the Choultry without being obliged to open the seales or to pay any Custome for the said Rubys untill they doe sell them, and after that they have sold them then they shall pay the usuall custome of one and a halfe per cent. and halfe per cent. to the Towne Broker and noe more, and when they doe not sell them in this place they may freely and without any hinderance carry away their said Rubys either by sea or land, or by what meanes soever they please without being any wise obliged to pay any Custome for the same; The same shall be understood for Jewells and Rings as for loose Rubys, noe Custome shall be paid for any Gold or Silver that they shall bring to this place, and for all other goods Imported or Exported they shall pay noe otherwise then according to the Custome and usage of the place, and this Cowle I the Agent and Governour with the advice and consent of my Councell doe grant in the behalfe of the Hon^{ble} English East India Company, dated in ffort St. George the 23th February Anno Domini 1679-80.

STREYNESHAM MASTER.

PROCEEDINGS

OF THE

BURMA RESEARCH SOCIETY.

TEXT PUBLICATION SUB-COMMITTEE.

Minutes of the Seventeenth meeting of the Text Publication Sub-Committee of the Burma Research Society, held at University College on Wednesday, the 9th February 1927 at 8 a.m.

PRESENT.

1. Prof. Pe Mäung Tin, M.A., B.Litt., I.E.S. (in the chair).
2. U Tun Pe, M.A., B.L., M.R.A.S.
3. Mr. A. Cassim, B.A. (*Secretary*).

1. Confirmed the minutes of the meeting of the Sub-Committee held on the 6th August 1925.

2. With reference to Mr. Swithinbank's donation of Rs. 525 it was resolved to report to the Executive Committee that, with its sanction, the Text Publication Sub-Committee proposes to search for Manuscripts of independent classical works, and that a start has been made with a search for MSS. of U Kyin U's "Winkanta Zat" and U Ponnya's "Myit-taza" with the object of bringing out critical editions of these works.

3. *Confirmed—*

- (a) office circular No. 23, dated the 16th September 1926, approving the publication of U Kyin U's "Taw-bwè Taung-bwè and Padetha Thigyin";
- (b) office circular No. 26, dated the 28th September 1926, agreeing to accept payment by the Pyi Gyi Mundyne Press of a royalty to the Society at the rate of 20 per cent. on the sale proceeds of the 1st edition of 2,000 copies of the "Papahein Zat" and 5 per cent. on the sale proceeds of the 1st edition of 500 copies of the "Padetha Thigyin";
- (c) office circular No. 25, dated the 20th September 1926, approving the publication of the "Thutathoma Pyo" in the Text Publication Series by the Sun Press, Ltd., and agreeing to accept the payment by the press of a royalty at the rate of 10 per cent. on the sale proceeds of the 1st edition of 2,000 copies of the work. Further, agreeing to defer publication of the "Lives of Famous Ministers of the Burmese Court" pending enquiries regarding its sources.

4. Resolved that Saya Pwa be requested to ask the Hanthawaddy Press to expedite the publication of "Nawarat Pyo" and "Kyama Daik Min Vathu" sanctioned for publication in the Series.

5. The General Editor reported that—

- (a) the "Padetha Thigyin" had reached the stage of final proof and would soon be out ;
- (b) the "Papahein Zat" was being edited by Saya Lin, A.M.P., and was in the press ; and
- (c) the "Thutathoma Pyo" was being collated by Saya Lin, A.M.P., with the manuscript in the Bernard Free Library and would be ready for the press shortly.

AHMED CASSIM,
Honorary Secretary,
Text Publication Sub-Committee.

Minutes of the meeting of the Executive Committee of the Burma Research Society held at University College on Friday, the 11th February 1927, at 6-30 p.m.

PRESENT.

- 1. The Hon'ble Mr. Justice Maung Ba, K.S.M., B.A. (*President*).
- 2. J. S. Furnivall, Esq., B.A., I.C.S., (Retired).
- 3. C. W. Dunn, Esq., C.I.E., B.A., I.C.S.
- 4. Prof. D. G. E. Hall, M.A., F.R.Hist.S., I.E.S.
- 5. U tun Pe, M.A., B.L., M.R.A.S.
- 6. Prof. F. J. Meggitt, M.Sc., Ph.D., I.E.S.
- 7. Prof. W. G. Fraser, M.A., I.E.S.
- 8. S. G. Grantham, Esq., B.A., I.C.S.
- 9. Prof. Pe Maung Tin, M.A., B.Litt., I.E.S.
- 10. D. B. Petch, Esq., M.C., I.C.S.
- 11. A Cassim, Esq., B.A. (*Secretary*).

1. Confirmed the minutes of the meeting of the Executive Committee held on the 20th August 1926.

2. Recorded—

- (a) circular No. 27, dated the 18th October 1926, approving the Honorary Secretary's letter to the Government for continuance of the Government contribution to the Dictionary project ;

- (b) letter No. 553U25, dated the 25th November 1926 from the Local Government sanctioning the payment of Rs. 2,500 being Government's contribution to the Dictionary scheme for 1927-1928 ;
- (c) Text Publication Sub-Committee's circular No. 23 dated the 16th September 1926 approving the publication of 'U Kyin U's "Taw-bwe Taung-bwe and Padetha Thigyin" ;
- (d) Text Publication Sub-Committee's circular No. 26 dated the 28th September 1926 approving the agreement with the Pyi Gyi Mundyne Press for the payment by it of a royalty to the Society at the rate of 20 per cent. on the sale proceeds of the 1st edition of 2,000 copies of the "Papahein Zat" and 5 per cent. on the sale proceeds of the 1st edition of 500 copies of the "Padetha Thigyin" in consideration of the works being included in the Text Publication Series ;
- (e) Text Publication Sub-Committee's circular No. 25, dated the 20th September 1926 approving the publication of "Thuthoma Pyo" in the Text Publication Series by the Sun Press on payment of a royalty to the Society at the rate of 10 per cent. on the sale proceeds of the first edition of 2,000 copies ; further, to defer the publication of the "Lives of Famous Ministers of the Burmese Court" pending enquiries as to its sources ;
- (f) circular No. 28, dated the 9th November 1926 remitting to the Text Publication Sub-Committee for report Mr. Swithinbank's donation of Rs. 525 for the purchase of independent manuscripts ;
- (g) circular No. 30, dated the 30th November 1926, approving Prof. Pe Maung Tin's suggestion to present copies of the Society's Journal to the Library of the Burma Legislative Council beginning with the 1926 issues ;
- (h) letter dated the 28th July 1926 from Mr. G. H. Luce, I.E.S., acknowledging the receipt of Rs. 499-15-0 for the purchase of books for the Society's Library.

3. *Approved*. Mr. Grantham's recommendations on Mr. Harvey's suggestion regarding the pagination of reprints for contributors of articles to the Journal, and *resolved* that the Honorary Editors be requested to ask contributors the number of reprints they would like to have of their papers.

4. Recorded Mr. Swithinbank's letter dated the 6th November 1926 and resolved to thank him for his presentation of a copy of Barnett's "Catalogue of Burmese Books in the British Museum, 1913".

5. (a) *Approved* the Honorary Secretary's draft of the Annual Report of the Society for the year 1926 ;

- (b) Appointed a Sub-Committee consisting of the President, Mr. S. G. Grantham, I.C.S., and Honorary Treasurer to consider the question of the Society's investments;
- (c) Fixed Friday, the 25th February 1927, for the Annual General Meeting and made the necessary arrangements for it.
- 6. Recorded office circular No. 2 dated the 4th February 1927 approving Prof. F. J. Meggitt's proposal that copies of the Science number of the Journal be sent to certain Scientific Journals for review.
- 7. Recorded the minutes of the Seventeenth meeting of the Text Publication Sub-Committee held on the 9th February 1927.
- 8. Recorded the circular forwarding the Progress Report of the Dictionary Sub-Committee for 1926.

AHMED CASSIM,
Honorary Secretary,
Burma Research Society.

The 25th February 1927,

*A meeting of the Executive Committee of the Burma Research Society was held at the University College on Wednesday, the 9th March 1927.
at 6-30 p.m.*

PRESENT.

J. S. Furnivall, Esq., B.A. (Chairman).
U Po Sein, A.T.M.
Prof. Pe Maung Tin, M.A., B.Litt., I.E.S.
C. W. Dunn, Esq., C.I.E., B.A., I.C.S.
L. F. Taylor, Esq., B.A., I.E.S.
Prof. D. G. E. Hall, M.A., F.R.Hist. S., I.E.S.
Saya U Thein.
U E Maung (Honorary Secretary).

MINUTES.

- 1. Confirmed the minutes of the Executive Committee held on the 11th February, 1927.
- 2. Elected the following to the Sub-Committee for 1927: Messrs. Hall, U Po Sein and U Tun Pe.
- 3. The following were elected to form the Text Publication Sub-Committee:—Messrs. Pe Maung Tin (General Editor), U Tin, Furnivall, Luce, U Po Sein, U Tun Pe and Cassim (Secretary).

4. Recorded office circular No. 1, dated the 27th January 1927, sanctioning to place "Kern Institute" on the Exchange list for the Journal.

5. Considered letter from Rev. J. E. Cummings and resolved that the Committee regrets the request cannot be granted.

Messrs. Hall, Taylor and E Maung were appointed to form a Sub-Committee to enquire into the feasibility of amending the rules to enable members to compound for life membership on a sliding scale.

6. Messrs. Major & Co.'s request for permission to reprint Prof. Fraser's Old Rangoon was granted.

7. Resolved that the Text Publication Sub-Committee be asked to report on its financial position with particular regard to the forming of a separate fund and the payment of royalties or corresponding gratuity to editors and to the granting of concessions, the price of books to members and others.

MAUNG E MAUNG,

The 15th March 1927.

Honorary Secretary.

The Annual General Meeting of the Burma Research Society for the year 1926 was held at University College on Friday, the 25th February 1927, at 6-30 p.m.

Among those present were Sir J. G. Rutledge, Kt., K.C., M.A., Messrs. C. W. Dunn, C.I.E., D. G. E. Hall, W. G. Fraser, W. C. B. Purser, Pe Maung Tin, Aspinall, J. E. Cummings, U Ba Thein, U E Maung, U Tun Pe, Ma Mya Sein, Miss Stewart, and Mr. A. Cassim (*Honorary Secretary*).

In the absence of the President, Mr. C. W. Dunn, C.I.E., I.C.S., one of the Vice-Presidents of the Society, took the chair.

Prof. D. G. E. Hall, M.A., F.R.Hist.S., I.E.S., read his paper entitled 'Sir Streynsham Master's Attempt to Re-open English Trade with Burma in 1680'. The lecture was followed with the keenest interest by all those present and Messrs. Purser, Cummings and Dunn took part in the discussion which followed.

The Honorary Secretary then presented the Annual Report of the Society for 1926 which was adopted unanimously.

The following Officers and Members of the Committee for 1927 were then elected :—

PRESIDENT.

The Hon'ble Sir J. G. Rutledge, Kt., K.C., M.A., Barrister-at Law.

VICE-PRESIDENT.

U Shwe Zan Aung, B.A., A.T.M., K.S.M.
The Hon'ble Mr. Justice U Ba, B.A., K.S.M.
J. S. Furnivall, Esq., M.A., I.C.S. (Retired).

HONORARY SECRETARY.

U E Maung, M.A., LL.B., Barrister-at-Law.

HONORARY TREASURER.

Ahmed Cassim, Esq., B.A.

HONORARY EDITORS AND LIBRARIANS.

Prof. Pe Maung Tin, M.A., B.Litt., I.E.S.
Prof. F. J. Meggitt, M.Sc., Ph.D., I.E.S.

EXECUTIVE COMMITTEE.

The Office bearers of the Society are

U Tin, K.S.M., A.T.M.
L. F. Taylor, Esq., M.A., I.E.S.
Prof. G. R. T. Ross, M.A., D.Phil., I.E.S.
The Hon'ble Mr. Justice U Mya Bu, Barrister-at-Law.
U Po Sein, A.T.M.
U Tun Pe, M.A., B.L., M.R.A.S.
D. J. Sloss, Esq., M.A., C.B.E., I.E.S.
Prof. D. G. E. Hall, M.A., I.E.S.
S. G. Grantham, Esq., I.C.S.
Prof. W. G. Fraser, M.A., I.E.S.
C. W. Dunn, Esq., C.I.E., I.C.S.
G. H. Luce, Esq., B.A., I.E.S.
D. B. Petch, Esq., I.C.S.
U Set, B.A.
Prof. W. N. Elgood, I.E.S.

GENERAL COMMITTEE.

J. L. McCallum, Esq., I.C.S.
 U Thein.
 Major C. M. Enriquez.
 U Kyi O, B.A., A.T.M., K.S.M.
 Taw Sein Ko, Esq., C.I.E.
 H. F. Searle, Esq., I.C.S.
 Dr. O. Hanson.
 R. C. J. Swinhoe, Esq.
 San Shwe Bu.
 Ch. Duroiselle, Esq., M.A.
 U Tha Tun Aung, B.A.
 J. A. Stewart, Esq., M.A., I.C.S.
 U Hla, B.A.
 U Tha Kin.
 G. E. Harvey, Esq., I. C.S.

The meeting dispersed with votes of thanks to the lecturer of the evening and the chair.

AHMED CASSIM,
Honorary Secretary.

ANNUAL REPORT, 1926.

ROLL OF MEMBERS—

At the end of the year the total number of members of the Society was 351 made up as follows :—

Honorary Members	..	..	2
Corresponding Members	..	...	6
Life Members	..	..	56
Ordinary Members	..	..	287
			<hr/>
			351

These figures, as compared with the roll of membership of the previous year show a decrease of four among the ordinary members and an addition of two among the Corresponding members of the Society. One Life member and four Ordinary members died, while nine members resigned during the year. Ten new members were elected of whom one became a Life member. Mr. A. Waley, Head of the Department of

Prints and Drawings, British Museum, London, and Mons. G. Coedes, President, Siam Society, Bangkok, accepted the invitation of the Committee to become Corresponding members. The number of libraries on the roll of subscribers remains the same as last year.

OBITUARY—

Death has been rather busy with some of the oldest members of the Society among whom may be particularly mentioned U May Oung, U Po Byu, and U Tun Nyein all of whom served from time to time in one capacity or another on the Council of the Society. U May Oung's connection with the Society was very intimate and lasted from the date of its foundation to his death. In fact, he had the honour of delivering the inaugural address founding the Society. He was for years one of the Vice-Presidents and also served as President for two terms in 1923 and 1924. A valued contributor to the Journal till his other duties prevented his contributing to it as often as he could wish, he yet maintained his interest in all the activities of the Society to the time of his death. In him the Society loses one who was a keen student of the art, literature, and history of his country. An obituary notice appears in the August Journal of this year. U Po Byu, a Vice-President of the Society in 1921-1923 rendered valuable services on the Executive Committee as well as on the Text Publication Sub-Committee for the Publication Series of which he acted as the editor of the "Kandawmingyaung Myittaza". U Tun Nyein—a Life member—joined the Society at its foundation and was its Treasurer for two years.

OFFICERS AND MEMBERS OF THE COMMITTEE—

Apart from U May Oung and U Po Byu, whose deaths created a vacancy among the Vice-Presidents and the Executive Committee respectively the other officers and members elected at the last Annual General Meeting remained in office throughout the year.

MEETINGS—

Two General Meetings of the Society were held.

(1) The Annual General Meeting, held on the 8th March 1926, when Mr. J. S. Furnivall, M.A., F.C.S. (Retired), then President of the Society, made a statement on the New Burmese Dictionary. There was a large and interested gathering present.

(2) An Ordinary Meeting, held on the 4th September 1926, at which Mr. J. A. Stewart, M.A., F.C.S., read a paper entitled "The New

Burmese Dictionary—Progress and Practical Hints". The Hon'ble Mr. Justice U Ba, B.A., K.S.M., President of the Society, was in the chair. The lecture, which was illustrated by lantern slides, was much appreciated by the audience.

The Committee desires to record its thanks to Mr. J. Brough, Secretary, Central Y.M.C.A., Rangoon, for his kind loan of the lantern used at the lecture and for the trouble he took in supervising its working.

The Executive Committee held two meetings during the year.

TEXT PUBLICATION SUB-COMMITTEE—

The following were the members of the Text Publication Sub-Committee for the year :—

Prof. Pe Maung Tin, M.A., B.Litt., I.E.S. (*Chairman*).

U Tun Pe, M.A., B.L., M.R.A.S.

U Tin, K.S.M., A.T.M.

Mr. J. A. Stewart, M.A., I.C.S., and

Mr. A. Cassim, B.A. (*Secretary*).

The Advisory Board of the Sub-Committee, which in previous years had consisted of an unwieldy number of members, was reconstituted to consist of :—

U Po Sein, A.T.M.

Saya Lin, Aggamahapandita, and

Saya Pwa.

PUBLICATIONS—

Maung Kala's Mahayazawingyi, Vol. I, the publication of which was mentioned as forthcoming in last year's Annual Report, has since appeared as No. 5 of the Text Publication Series. The Committee is happy to report that it has met with such cordial reception from the Vernacular press and the Burmese public that the publishers have been encouraged to ask the help of the Sub-Committee to prepare a further portion of the work to form the second volume. The Executive Committee, on the recommendation of the Text Publication Sub-Committee, has approved of the work being undertaken. A transcript of the manuscript in the Bernard Free Library has been made by the Society at a cost of Rs. 73-12-7, and the copy has been handed over to the editor who hopes to bring out the work some time this year. As the whole stock of the first edition of the "Owada-Du-Pyo" (No. 1 of the Text Publication Series) was exhausted the Committee sanctioned its reprint at a cost of Rs. 160. U Kyin U's "Papahein Zat" edited by Aggamahapandite Saya Lin and "Taw-bwe Taung-bwe and Padetha Thigyin,"

edited by Prof. Pe Maung Tin, M.A., B.Litt., I.E.S., are in the press, the latter having reached the stage of final proof. It was expected that two more works—Nawarat Pyo and Kyama Daik Min Vattu—for the publication of which sanction had been given to the Hanthawaddy press would have come out in the course of the year, but their publication has been delayed owing to the illness of the editor. It is hoped they will be ready before long.

An agreement has been entered into with the Pyi Gyi Mundyne Pitaka Press, the publishers of Maung Kala's Mahayazawingyi, whereby the press agrees to pay to the Society a royalty of 12 per cent. on every copy of the work sold. Similar agreements for royalties at varying rates have been made with the same press for the right of publication of the Papahein Zat and the Padetha Thigyin and with the Sun Press for the publication of the Thutathoma Pyo which is being edited by Saya Lin, Aggamahapandita, for inclusion in the Text Publication Series. The thanks of the Society are due to Prof. Pe Maung Tin, M.A., B.Litt., I.E.S., General Editor of the Text Publication Series, for obtaining very favourable terms from the publishers who in turn are glad to secure the expert assistance of members of the Sub-Committee to edit the works.

The Society is greatly indebted to Mr. B. W. Swithinbank, I.C.S., for his generous donation of a sum of Rs. 525 for the purchase of independent manuscripts of classical Burmese works with the object of providing a basis for future critical editions. Arrangements are being made to carry out his wishes to the best advantage.

THE NEW BURMESE DICTIONARY—

The Committee is glad to report that the Dictionary project is making rapid and satisfactory progress. A Sub-Committee of the Society consisting of Messrs. C. W. Dunn, I.C.S.; H. F. Searle, I.C.S.; Ch. Duroiselle, M.A.; U Pe Maung Tin, B. Litt., I.E.S.; U Tin, K.S.M., A.T.M.; U Kyi O, B.A., K.S.M., A.T.M.; with Mr. J. A. Stewart, M.A., I.C.S., as Secretary, is in charge of collecting words, arranging them in order, assisting with advice collaborators in the work, and preserving uniformity in the method of collection of words by readers of texts. Pamphlets in English—and Burmese for those unacquainted with English—dealing with the points to be observed when contributing to the Dictionary have been printed and distributed. Each contributor is given a text from which to collect words and a number of blank slips of uniform size to enter them in. All slips received are checked with the text supplied and omissions, faults of methods, etc., are regularly pointed out. At the end of the year the number of slips received at the Dictionary office was 19,008, among which are a large number not noticed elsewhere. These slips contain authentic illustrations of the uses of words thereby making it possible to give accurate definitions of their meaning. It is

obvious that it will also have a great value for students of Burmese grammar and syntax. The colloquial language has not been left out of consideration either. So far the collection of words from the following 8 works has been completed :—

Thuwunnashan Vatthu,
Mahawthahta Vatthu, Vol. I.,
Buridat Vatthu,
Vidura Vatthu,
Wethandaya Vatthu,
Hitawpadetha Kyan,
Abhiyuka Pyo, and
Monrazawin.

In order to arouse public interest in the Dictionary and to secure more contributors five short articles under the title of "Dictionary Jottings" have been contributed to the *Rangoon Daily News* by U Kyi O, B.A., A.T.M., K.S.M., the Rev. Mr. Halliday, Aggamahapandita U Athapa, and Mr. J. A. Stewart, M.A., I.C.S. Two articles by Prof. Pe Maung Tin, M.A., B.Litt., I.E.S., will follow.

The University of Rangoon also co-operates in the undertaking but works independently under a Sub-Committee consisting of Messrs. Luce, Furnivall and Pe Maung Tin. The University Sub-Committee supervises the collection of words from old Burmese inscriptions, unpublished historical records, and other manuscripts—whether published or unpublished—of works such as *bedin*, *nissayas* etc. In furtherance of the object the University has appointed a Research scholar on Rs. 170 a month to do work on the inscriptions. He has read and made transcriptions in modern characters of 21 inscriptions and has further card-indexed 11 of them on the principles adopted by the Dictionary Sub-Committee of the Society. In addition to the Research scholar, other undergraduate students belonging to the Honour classes of University College have been encouraged to assist. All the work done by them including that of the Research scholar is under the personal supervision of Prof. Pe Maung Tin, M.A., I.E.S.

The Government of Burma, satisfied with the progress made with the Dictionary project, has kindly promised to continue its contribution of Rs. 2,500 for the next year.

Three packets of Dictionary material and one copy each of Judson's Dictionary and U Tun Nyein's Dictionary annotated by the late Mr. A. L. Hough, Reader in Burmese at the School of Oriental Studies, London, were presented to the Society by the Director of the School to whom the Society is much obliged.

A donation of Rs. 100 to be used for the Dictionary at the discretion of the Dictionary Sub-Committee, was received from Mr. B. W. Swithinbank, M.A., I.C.S. The Society offers him its most cordial thanks.

THE JOURNAL—

Three numbers constituting Vol. XVI of the Journal appeared during the year, Parts, I and II under the editorship of Prof. Pe Maung Tin, M.A., B.Litt., I.E.S., containing articles of general literary or historical interest. Part III, edited by Prof. F. J. Meggitt, B.Sc., Ph.D., I.E.S., has recently come out as the second science number issued by the Society. In connection with it he reports as follows :—

“As at present there exists no periodical for papers dealing with the fauna and flora of Burma, the number fulfills a useful purpose and it is to be hoped that the funds of the Society will permit of its regular publication. In the domain of Zoology and Botany Burma is practically a virgin field. Arrangements are gradually being made by the “Biological” Departments of the constituent colleges of the University of Rangoon for the systematic study by recognised authorities of the various groups of the Burmese fauna and flora ; at present the following groups have been allocated :—

Cestoda	..	Prof. F. J. Meggitt	..	University of Rangoon.
Acanthocephala	..	Mr. Subramaniam	..	do.
Trematoda	..	Miss F. L. Northup	..	do.
Mematoda	..	Prof. F. L. Boulenger		Bedford College, London
Pisces	..	Dr. S. L. Hora	..	Indian Museum.
Coleoptera	..	Dr. Chapin	..	U.S.A. National Museum

and it is hoped

Orthoptera	..	Imperial Bureau of Entomology, London.
Reptilia	..	Prof. F. L. Boulenger.

As the various collections are identified lists will be published in the Journal which thus, in course of time will contain a complete record of Burmese animals and plants. The articles in the first two numbers of the Journal have all been contributed by the members of the staff of the University of Rangoon ; it is hoped that other members of the Society will take advantage of the opportunity offered to submit papers of scientific interest either in the direction of results of research, records of the fauna or flora of a definite locality or beliefs extant regarding animals or plants— the latter preferably accompanied by specimens for identification ”.

THE LIBRARY—

Exclusive of periodicals the total number of books added to the Library was 123. The additions are classified as under :—

From Government	..	..	8
By presentation	..	..	100
By exchange	..	..	13
By purchase	..	..	2
			<hr/>
			123
			<hr/>

With last year's total of 1,346, the Library now has 1,469 books on its roll. Only two books were purchased this year as the Committee had already sanctioned a sum of Rs. 500 to be advanced to Mr. G. H. Luce, I.E.S., to purchase in Europe books for the Society. The thanks of the Society are due to Messrs. Law, Barua and Swithinbank and Dr. Heingeldern as well as the Trustees of the Bernard Free Library and the President of the Royal Institute of Literature, Archaeology and Fine Arts, Bangkok, for their presentations of books.

Special mention deserves to be made of the splendid gift of 89 works in Siamese from the last named institution, and of Mr. W. Law's presentation of "A Comparative Vocabulary of the Barma, Malayu and Thai Languages" printed at Serampore, India, in 1810.

FINANCES—

The accounts of the Society are shown in two appendices attached to this report. Appendix "A" shows the actual receipts and expenditure for the year while Appendix "B" gives a statement of the investments held by the Society. In the former, apart from the usual sources of revenue, mention may be made on the receipts side of a sum of Rs. 2,500 from the Local Government, being its first contribution to the Dictionary scheme and a sum of Rs. 625 received as donation from Mr. B. W. Swithinbank, M.A., I.C.S., for certain specified purposes. The main items of extraordinary expenditure during the year are the sum of Rs. 500 advanced to Mr. G. H. Luce, I.E.S., for the purchase of books for the Library, Rs. 73-12-7 incurred on account of the copying of portions of Maung Kala's Mahayazawingyi, and Rs. 160 spent on a second edition of the "Owada-Du-Pyo". Against these two last items should be set the sum of Rs. 97-14-0 obtained through the sale of the Owada-Du-Pyo and Rs. 63 received from the Pyi Gyi Mundyne Press as royalty on the sale of 126 copies of Vol. I of Maung Kala's Mahayazawingyi (No. 5 of the Text Publication Series). A sum of Rs. 1,000 deposited with the Burma Provincial Co-operative Bank, Mandalay, was realised during the year, and transferred to the current account.

AHMED CASSIM,
Honorary Secretary.

APPENDIX A. BURMA RESEARCH SOCIETY.

Annual Accounts for 1926.

Receipts.	Amount.	Payments.	Amount.
	Rs. A. P.		Rs. A. P.
Balance from 1925 ..	7,160 2 6	Clerk's pay ..	480 0 0
Members' subscriptions ..	3,298 0 0	Peon's pay ..	201 2 9
Investment realised ..	1,000 0 0	Typing fee ..	16 9 0
Interest on investments ..	319 6 0	Printing of Journals (3 issues)	2,217 0 0
Sale of Journal ..	195 0 0	Stationery ..	49 4 0
Sale of Glass Palace Chronicle ..	188 15 6	Books, periodicals, &c. ..	17 10 0
Sale of Owadahtu Pyo ..	97 14 0	Postage stamps ..	283 0 0
Royalty on sale of Maung Kala Mahayazawin ..	63 0 0	Contingencies ..	15 11 0
Government subsidy for Dictionary Scheme ..	2,500 0 0	Printing and purchase of forms ..	39 6 0
Special donation by Mr. Swithin-bank ..	625 0 0	Advertising ..	60 0 0
Recovery of postage charges ..	8 2 0	Subsidy to New Burmese Dictionary Fund ..	2,600 0 0
		Printing charges on account of Dictionary Fund ..	47 8 0
		Advance to Mr. Luce for purchase of books in England ..	500 0 0
		Copying of Maung Kala Mahayazawin ..	73 12 7
		Printing of Owadahtu Pyo ..	160 0 0
			6,760 15 4
		New Investments.	
		Three years Fixed Deposit No. 1355 with Burma Provincial Co-operative Bank dated 12th March 1926 ..	4,000-0-0
		Six months Fixed Deposit No. A1505 with Dawson's Bank dated the 13th September 1926 ..	1,000 0-0
		Saving Bank Deposit with Dawson's Bank ..	2,000-0-0
		Cash :—	
		At Bank ..	1,675 8-8
		In Honorary Treasurer's hand ..	20-0-0
			1,695 8 8
TOTAL ..	15,456 8 0	TOTAL ..	15,456 8 0

APPENDIX B

Statement of Investments on 31st December 1926.

Government of India 10 years 6 % bonds (per value) ..	Rs. 4,500
Post Office Cash Certificates :—	Rs.
Nominal value held at end of 1925 ..	4,500
Increment of value of the same 'on 3rd January 1927) ..	954
Nominal value of certificates bought during the year ..	Nil
Fixed Deposits — (Old Deposits) ..	Nil
(New Deposits as in cash account) ..	7,000
TOTAL ..	16,954

LIST OF RECENT ADDITIONS TO THE LIBRARY.

- Indian Antiquary, October, 1926—February 1927.
 Man in India, Nos. 2, 3, 4—1926.
 Journal of Siam Society, Vol. XX, Parts 1, 2.
 Annals of the Bhandarkar Institute, Vol. VIII, Parts 2, 3, 1926-27.
 Journal of Royal Anthropological Institute of Great Britain and Ireland,
 Vol. LVI, 1926 (January to June).
 T'Oung Pao Nos. 2—5, 1925-26 (Vol. XXIV).
 Bulletin des Amis du Vieux Hue, No. 2 13e Annee, Avril-Juin 1926.
 Südostasien, by Dr. Robert Heine-Geldern.
 Mandalay und der birmanische Königshof, by Dr. Robert Heine-Geldern.
 Altjavanische Bronzen, by Dr. Robert Heine-Geldern.
 Eine Szene aus dem Sutasoma-Jataka auf Hinterindischen und indonesischen
 Schwertgriffen by Robert Heine-Geldern.
 Sonderabdruck aus dem Archiv für Anthropologie—Gibt es eine austro-
 asiatische Rasse?, by Dr. Robert Heine-Geldern.
 Kopffjagd und Menschenopfer in Assam und Birma und ihre Ausstra-
 hlungen nach Vorderindien, von Dr. Robert Freiherrn u. Heine-
 Geldern.
 Mutterrecht und Kopffjagd in Westlichen Hinterindien, von Dr. Robert
 Heine-Geldern.
 Reprint from Dalrymple's Oriental Repertory, 1791-7 of portions relating
 to Burma.
 Journal of East India Association (Vol. XVII) No. 4, October 1926 ;
 (Vol. XVIII) No. 1, January 1927.
 Report of the Superintendent, Archaeological Survey, Burma, for 1925-26.
 Agricultural Map of U.S.S.R. edited by Prof. N. I. Vavilov—28th Sup-
 plement to the "Bulletin of Applied Botany and Plant Breeding."
 Mitteilungen der Anthropologischen Gesellschaft in Wien, LVI, Band,
 V. u. VI. Heft ; LVII, I. Heft.
 Journal and Proceedings of the Asiatic Society of Bengal, New Series,
 Vol. XXI, No. 3.
 Journal of the Royal Asiatic Society of Great Britain and Ireland, 4th
 Quarter 1926, 1st Quarter 1927.
 Bulletin of Applied Botany and Plant Breeding, Vol. XVI, Nos. 4 and 5.
 Catalogue of Burmese Books in the Library of the British Museum.
 Bulletin of School of Oriental Studies, London Institution, Vol. IV,
 Part II.
 Memoirs of the Archaeological Survey of India—No. 31. The Indus
 Valley in the Vedic Period, by Ramparasad Chanda.
 Zeitschrift der Deutschen Morgenländischen Gesellschaft, Bands 4, 5, 6 ;
 Heft 1, 2, 3.
 Catalogue of Sanskrit and Prakrit MSS. in the Central Provinces and
 Berar by Rai Bahadur Hiralal.

- A Comparative Vocabulary of Burma, Malayu and Thai Languages,
by John Leyden (1810).
Journal Asiatic, Tome CCVIII, Nos. 1, 2.
Journal of the Malayan Branch of Royal Asiatic Society, Vol. IV, Part II,
October 1926.
Bulletin des Amis du Vieux Hue (July and September 1926).
Oudheidkundig Verslag 1925.
Djawa, No. 1, January 1927.
Memoirs of Archaeological Survey of India, No. 29—Specimens of Calli-
graphy in the Delhi Museum of Archaeology.
-

LIST OF MEMBERS (Dec. 31st, 1926.)*

*Life member.

†Corresponding member.

‡Honorary member.

*Adamson, Sir Harvey, c/o India Office, London.

Aiyar, N. C. Krishna, M.A., University College, Rangoon.

Aung[†] U Shwe Zan, B.A., A.T.M., K.S.M., No. 5, Innes Road, Kemmendine.

Aung, U Tha Tun, B.A., Additional District and Sessions Judge, Pegu.

Aung, U Kyaw Za, S. D. O., Kyauktaw (Akyab District).

Aung, U Lun, Myook, Paungdè, (Tharrawaddy).

*Ba, U, A.T.M., Income-tax Assessor, Mandalay.

Ba, U, The Hon'ble Mr. Justice, Judge, High Court, Rangoon.

Bah, U, Rice Miller, Payagale-upon-Kyaiklat Stream, Kyaiklat.

*Ban, U Shwe, *Bar-at-Law*, 15, York Road, Rangoon.

Barretto, Miss E., Principal, Victoria Buddhist Girls' School, 57, Canal Street, Rangoon.

Baw, U Hla, I.S.O., K.S.M., District and Sessions Judge, (retired) Bassein.

Baw, U Htoon, Banker, Akyab.

Bazett, H. M., S. D. O., Kawkareik, Amherst.

Bhimani, A. R., Proprietor, Gujarat Press, No. 6, Maung Tawlay Street, Rangoon.

Bhymeah, H. M. E., 151, Monkey Point Road, Rangoon.

Bilimoria, J. C., B.A., *Bar-at-Law*, University College, Rangoon.

Bishop, F., 16, Leamouth Grove, Edinburgh.

†Blagden, Dr. C. Otto., School of Oriental Studies, Finsbury Circus, London, E. C. 2.

Bose, S. C., Chief Executive Officer, Calcutta Corporation.

Brookes, A., I.E.S., Principal, Intermediate College, Mandalay.

Brookes, Major W. L., I.M.S., Civil Surgeon, Lashio, N. S. S.

Brough, Joseph, Secretary, Y. M. C. A., Central Branch, Rangoon.

*Brown, G. E. R. Grant, c/o Messrs. Thomas Cook & Son, Ltd., London.

Brown, The Hon'ble Mr. Justice H. A., I.C.S., *Bar-at-Law*, Judge, High Court Rangoon.

Brown, R. R. I.C.S., Deputy Commissioner, Arakan.

Browne, C. E., I.S.O., Loi-an, Kalaw, S. S. S.

Bu, The Hon'ble U Mya, *Bar-at-Law*, Judge, High Court of Judicature, Rangoon.

Bu, U San Shwe, Teacher, Govt. High School, Akyab.

Bush, S. P., Govt. Architect, Secretariat, P.W.D., Rangoon.

Butler, Sir Spencer Harcourt, G.C.I.E., K.C.S.I., Patron.

* Members are particularly requested to inform the Hony. Secy. of any change in their address.

- Buttress, E. W., B.A., B.E.S., Offg. Inspector of Schools, Akyab.
 Bwa, U Ba, Excise Inspector, Prome.
 †Caedes, G., President, Siam Society, Bangkok, Siam.
 Campbell, A., M.A., M.C., University College, Rangoon.
 *Carr, The Hon'ble Mr. Justice W., I.C.S., Judge, High Court of Judicature, Rangoon.
 *Carroll, E. W., Imperial Forest Service, c/o Messrs. Thomas Cook & Son, Ltd., Rangoon.
 Cassim, A., B.A., Pali Lecturer, University College, Rangoon.
 Cassim, M., Head Master, Govt. Normal School, Akyab.
 Chambers, W. P. C., Messrs. Steel Bros., Toungoo.
 *Chit, U Po, A.T.M., S. D. O., Meiktila.
 Cho, U E, Govt. Translator, Secretariat, Rangoon.
 Clague, J., B.A., I.C.S., Secretary to Govt. of Burma, Education Dept.
 Clark, Dr. G. F., M.A., Ph.D., Professor, University College, Rangoon.
 Clayton, H., M.A., I.C.S., C.I.E.
 Cleburne, J. St. H., Deputy Commissioner and District Superintendent of Police, Papun.
 *Cochrane, R. A., Divisional Forest Officer, Katha.
 Collis, M. S., B.A., I.C.S., Deputy Secy. to Govt. of Burma.
 Connor, J. P., Addl. Asst. Director of Land Records, Burma.
 Cooper, C. R. P., Secy. to Govt. of Burma.
 Cooper, R. E., Superintendent, Agricultural Society of Burma, Rangoon.
 *Couper, T., M.A., I.C.S., Financial Commissioner, Burma.
 †Craddock, The Hon'ble Sir Reginald Henry, K.C.S.I., I.C.S.
 *Cuffe, Lady, "Leyrath" Kilkenny, Ireland.
 Cummings, Rev. Dr. J. E., M.A., D.D., Henzada.
 Danson, J. W. W., Minera Hall, near Wrexham, North Wales.
 Darne, Rev. Father A., Military Chaplain, Roman Catholic Cathedral, Mandalay.
 Darwood, J. W., 77, Merchant Street, Rangoon.
 Davis, C. K., Land Officer & Secretary, Rangoon Development Trust, Rangoon.
 Dawson, L., *Bar-at-Law*, Pyapon.
 de Silva, Thos. P., c/o Messrs. Harperink, Smith & Co., Rangoon.
 Doe, U Ah, *Bar-at-Law*, Akyab.
 Drysdale, Rev., J. A., M.A., Morpeth, Northumberland.
 Dun, U Kyaw, K.S.M., Nyaungwaing Road, Thaton.
 Dunn, C. W., B.A., I.C.S., C.I.E., 27, Windermere Park, Rangoon.
 Duroiselle, Ch., M.A., Superintendent, Archaeological Survey, Mandalay.
 E, U Ba, B.A., A.T.M., K.S.M., Provincial Training Officer, Rangoon.
 *E, Khoo Soo, Merchant, 3A, 23rd Street, Rangoon.
 E, U Tun, Taikthugyi of Tamwe Circle, 50, 51st Street, Rangoon.
 Elgood, Major, W. N., M.C., B.Sc., I.E.S., Prof., University College, Rangoon.
 Enriquez, Major C. M., c/o Messrs. Thos. Cook & Son, Ltd., Rangoon.
 Ewing, Capt. R. R., I.A., c/o Messrs. Thos. Cook & Son, Ltd., Rangoon.
 Fraser, W. G., M.A., University College, Rangoon.
 *Furnivall, J. S., M.A., I.C.S., 40, Park Road, Rangoon.

- Fyffe, The Right Rev. R. S., Bishop of Rangoon.
 Gale, U Maung, Deputy Commissioner, Minbu.
 Gale (6), U Maung, Additional District and Sessions Judge, Bassein.
 Gale, U Maung, Subdivisional Police Officer, No. 235, Taungkon, Sangyaung, Kemmendine, Rangoon.
 Gates, G. E., 144, High Street, Keene, N. H., U. S. A.
 Gaudoin, E. T. D., B.A., Assistant Superintendent, Shwegu (Bhamo).
 Ginwala, P. P., *Bar-at-Law*, Member of Tariff Board, India.
 Glay, U Lu, Hd. Quarters Deputy Superintendent of Police, Tavoy.
 Goldsworthy, L. G., I.E.S., Lecturer, University College, Rangoon.
 Gon, U Ba, Superintendent, Copying Department, High Court, Rangoon.
 *Grantham, S. G., B.A., I.C.S., Secretariat.
 Green, Capt. J. H., I.A., Kachin Unit, Maymyo.
 Green, Lieut.-Col. G. E. T., 3, Kalaw, S.S.S.
 Gyi, The Hon'ble Sir Joseph A. Maung, *Bar-at-Law*, Home Member, Govt. of Burma.
 Gyi, U Maung, Excise Inspector, Eastern Circle, Mandalay.
 Gyi, Maung Maung, Superintendent of Land Records, Pegu.
 Gyi, Maung Maung, M.R.A.S., Inspector of Excise, Mandalay.
 Hall, Prof. D. G. E., M.A., F.R.Hist.S., I.E.S., University College, Rangoon.
 †Halliday, Rev. R., "Mount Pleasant", Moulmein.
 Han, U Kyin, T.D.M., Deputy Superintendent of Police (retired), 21, Creek Street, Rangoon.
 Hanson, Rev. O., D.D., A. B. Kachin Mission, Bhamo.
 Harvey, G. E., M.A., I.C.S., S. D. O., Maymyo.
 Hashim, M., Calico Expert, 90-91, Merchant Street, Rangoon.
 Heath, C. J., District Superintendent of Police, Tavoy.
 Hendry, D., M.C., B.Sc., Dy. Dir. of Agriculture, Burma.
 Hertz, W. A., "Kingsleigh," St. Alban's Gardens, Teddington, Middlesex.
 Hindley, Gordon, c/o Messrs. Steel Bros. & Co., Ltd., Toungoo.
 Hla, U, B.A., Subdivisional Officer, Minbu.
 Hla (1), U Aung, B.A., District and Sessions Judge, Prome.
 Hla, U Ba, Officer-in-charge, Special Surveys, Burma, Shwebo.
 Hla, U Kyaw Zan, 1st Additional District Judge, Mandalay.
 Hla, U Tun, Pali Teacher, Govt. High School, Rangoon.
 *Hlaing, U Po, Township Officer, Tilin (Pakokku).
 Hlaing, U Tun, Asst. Registrar, Co-operative Societies, Shwebo.
 Hogg, J., M.L.C., Messrs. Harperink, Smith & Co., Rangoon.
 Howard, R. L., Principal, Judson College, Rangoon.
 Htin, Saw Chin, B.A., Offg. Inspector of Schools, (on furlough.)
 Htoon, U Tha, Banker, Rupa Quarter, Akyab.
 Hunter, Sir John Mark, M.A., D.Litt., I.E.S., Woodleigh, Ascot, England.
 †Hunter, M., M.A., D.Sc., C.I.E., c/o Messrs. Thos. Cook & Son, Ltd., London, E. C.
 Hutton, J., Inspector of Police, Katha.
 I, U Maung, Additional District and Sessions Judge, Magwe.
 Jevons, Prof. H. S., M.A., F.S.S., University College, Rangoon.

- Jones, Rev. B. M., 27, Creek Street, Rangoon.
 Jones, T. Martin, 6, Prome Road, Rangoon.
 Josif, Rev. Geo. D., M.A., 15, Mission Road, Rangoon.
 Jury, Rev. G. S., Judson College, Rangoon.
 Kan, U., Additional Magistrate, Tavoy.
 *Karpeles, Mademoiselle Suzanne, Conservateur de la Bibliothique Royal,
 Phnom Penh, Indochina, Cambodia.
 Kay, R. G., Engineer, Messrs. Ellerman's Arracan Rice & Trading Co.,
 Ltd., Dawbong Mill, Rangoon.
 Keith, A. D., B.A., *Bar-at-Law*, Mason's Building, 35th Street, Rangoon.
 Keith, The Hon'ble Sir Wm. J., M.A., I.C.S., Finance Member, Govt. of
 Burma.
 Kelly, B. P., Deputy Conservator of Forests, Thaton.
 Khalak, A., St. John's College, Rangoon.
 Khin, Capt. H. Aung, Indian Station Hospital, Meiktila.
 Kin, U Tha, Advocate, Pyapon.
 Kin, U Thein, B.A., A.T.M., F.C.S., Chemist, Harcourt Butler's Institute
 of Public Health, Rangoon.
 *Ko, Taw Sein, C.I.E., "Peking Lodge," West Moat Road, Mandalay.
 Ku, U Maung, Additional Magistrate, Nyaunglebin.
 Kya U, Ba, B.A., Assistant Pali Lecturer, University College, Rangoon.
 Kyaw, U, B.A., Assistant Registrar, Co-operative Societies, Moulmein.
 Kyaw (2), U Ba, K.S.M., *Bar-at-Law*, 8, Link Road, Insein.
 Kye, U Po, Subdivisional Officer, Mawlaik, Upper Chindwin.
 Kyin, K. Maung, Manager, Ma Nu & Sons, Merchants and Landlords,
 Bazaar, Prome.
 Kywe (1), U Circle Inspector of Police, Zigon.
 *Lack, Major L. H. A., I.M.S., Lecturer, University College, Rangoon.
 Latt, U Ba Pe, Superintendent, S. I. Thippan Institution, Pazundaung.
 Lees, M. L., I.C.S., Manager of Govt. Estate, Burma.
 Lightfoot, S. St. C., Taunggyi.
 *Lin, U We, B.A., K.S.M., I.E.S., Inspector of Schools, (on furlough).
 List, J. N., Executive Engineer, Akyab.
 Livesey, Capt. T. R., B.A., M.B., O.V., Loikaw, Karenni, S. S. S.
 *Llay, U Shwe, Kado Rubber Estate, Kado, Moulmein.
 Lloyd, I. G., B.A., I.C.S., Commissioner, Magwe.
 *Luce, G. H., B.A., I.E.S., University College, Rangoon.
 Lander, A. J. M. I.C.S., o/o Messrs. A. Scott & Co., Rangoon.
 Lat, U, Asst Registrar, Co-operative Societies, Henzada.
 Lwai, W. A., Toll Collector, Myitkyo Lock, Pegu & Sittang Canal, Myitkyo
 (Pegu District).
 *McCallum, J. L., I.C.S., Commissioner, Federated Shan States.
 MacKenna, Sir James, M.A., C.I.E., kt., Development Commissioner
 Burma (on furlough).
 McPhredran, Arch., Works Assistant, c/o B. O. C., Ltd., Danneedaw,
 Rangoon.
 Mariano, V. J., *Rangoon Gazette*, Rangoon.
 Marshall, Rev. H. I., "Seminary Hill", Insein.

- Marshall J. B., M.A., B.Sc., C.I.E., I.C.S., (on furlough).
 Martin, U, Deputy Inspector of Karen Schools, Toungoo.
 Massink, W., Consul for the Netherlands, P. O. Box 119, Rangoon.
 Mathew, H. M., Messrs. Steel Bros., Rangoon.
 Maung, U Maung, Superintendent, Office of Supdg Engr., Northern Irrigation Circle, Maymyo.
 Maung, U Maung, A.T.M., Offg. Inspector of Schools, Insein.
 Maung, U Chit, E. A. C., Headquarters Assistant, Hanthawaddy.
 Maung, U E, M.A., LL.B., *Bar-at-Law*, Gyogon, (Insein).
 Maung, Lieut. Kin, 5/70 Burma Rifles, Maymyo.
 Maung, U Sein, Township Judge, Tantabin.
 *Maung, U Thein, Retired Myook, Aukyin Quarter, Thaton.
 Maung, U Thein, M.A., LL.B., *Bar-at-Law*, 6, Barr Street, Rangoon.
 Maung (2), U Thein, Treasury Officer, Pyapon.
 Maung, U Thein Teacher, Govt. High School, Pyapon.
 *Maung, U Tso, T.P.S., F.R.C.I., Broker, Ellerman's Arracan Rice & Trading Co., Ltd., Bassein.
 Maung, U Tun, Junior Assistant Registrar, Co-operative Societies, Monywa.
 Maung (2), U Tun, B.A., Akunwun, Toungoo.
 *Maye, Rev. Joseph, Catholic Missionary, Mergui.
 *Me, U, K.S.M., C.I.E., Deputy Commissioner, Prome.
 Medd, Capt. G. H. M., Agent, Irrawaddy Flotilla Co., Ltd., Bhamo.
 Meggitt, Prof. F. J., M.Sc. Ph.D., University College, Rangoon.
 Milner, C. E., Deputy Conservator of Forests, Moulmein.
 Min, U Kyaw, B.A., I.C.S., Subdivisional Officer, Wakema.
 *Mong, Saw Hkun, *Myoza aof* Mong Kung State, Southern Shan States.
 Moore, H. C., B.A., I.C.S., 26, Churchill Road, Rangoon.
 Morris, A. R., I.C.S., Deputy Commissioner, Tavoy.
 Morris, A. P., B.Sc., A.M. Inst. C.E., Principal, Govt. Engineering School, Insein.
 Mukerjee, H. C., B.E., Subdivisional Officer, P. W. D., Pa-an.
 Munro, G. F., I.E.S., Inspector of Schools, Moulmein.
 Myaing, U Ba, Asst. Govt. Translator; Secretariat, Rangoon.
 Myat, U Tun, T.D.M., 3rd Additional. Magistrate, Bassein.
 Myint, U Aung, E. A. C., Salin.
 Naikwara, Md. Usooff, Merchant, 52, Maung Taulay Street, Rangoon.
 Nepean, N. St. V., Assistant Superintendent, Namtu. Northern Shan States.
 Nixon, A. B., P. A. to Chief Conservator of Forests, Rangoon.
 Nolan, J. J., c/o Chartered Bank of India, 38, Bishopsgate, London, E.C. 2.
 Nolan, Capt. M. C., Kachin Unit, attd. 1/10th Gurkha Rifles, Mandalay.
 Nu, U San, Circle Inspector of Police, Bassein.
 Nyein, (1), U, A.T.M., Subdivisional Magistrate, Mandalay.
 Nyo, U Lu, A.T.M., Sub-Engineer, P. W. D., Tavoy.
 *Nyun, U San, Hony. Magistrate, Pegu.
 O, U Kyi, B.A., A.T.M., K.S.M., Superintendent of Land Records (retired), Thaton.

- Oates, S. J., Thindawyo Camp, Hmawbi.
 *Ogilvie, G. H., B.Sc., M.C., Divisional Forest Officer, Myitkyina.
 Osborn, Dr. H. B., 19, Sule Pagoda Road, Rangoon.
 Ottama, Rev. Bhikkhu U, Tattawin Kyaung, Kamayut.
 Oung, U Ba, Inspector of Police, on special duty, Fytche Road, Bassein.
 Oung, Mrs. Hla, 3A, Pagoda Road, Rangoon.
 Oung, Chan Htwan, Pleader, Akyab.
 Owen, L. G., M.A., University College, Rangoon.
 *Page, A. J., B.A., I.C.S., c/o Barclay's Bank, Ltd., 78, Victoria Street, London, S. W. 1.
 Paik, U, Deputy Superintendent of Police, Tharrawaddy.
 Pan, U, Sub-Registrar, Gyobingauk.
 Pe (2), U, Subdivisional Officer, Magwe.
 Pe, U Ba, Myook, Yamethin.
 Pe, U Hla, Pleader, Prome.
 Pe, U Hline, Sub-Asst. Surgeon, Konglu (outpost), Putao District.
 *Pe, U On, "Rosebank", Cantonments, Moulmein.
 Pe, U On, B.A., B.L., Pleader, Myaungmya.
 Pe, U Po, K.S.M., Deputy Commissioner (retired), Wakema.
 Pe, Saya, 18, Sule Pagoda Road, Rangoon.
 Pe, U Than, Junior Assistant Registrar, Co-operative Societies, Myaungmya.
 Pe (1), U Thaug, B.A., Subdivisional Officer, Bhamo.
 Pe, U Tun, M.A., B.L., M.R.A.S., Lecturer, Judson College, Rangoon.
 Peacock, D. H., I.E.S., Professor, University College, Rangoon.
 Pelly, Major H. R., I.A., Deputy Commissioner, Maubin.
 *Pennell, C. S., M.A., M.C., I.C.S., c/o Grindlay & Co., 54, Parliament St., London, S. W. 1.
 Perroy, The Right Revd. Bishop F., Vicar Apostolic of Southern Burma.
 Petch, D. B., B.A., M.C., I.C.S., Under Secretary to Govt. of Burma.
 Po, U Ba, Township Officer, Pwinbyu.
 Porter, A. W., Assistant Superintendent, Fort Harrison, Sadon.
 Powell, Capt. J. H., Agent, Irrawaddy Flotilla Co., Ltd., Bhamo.
 Pru, U Saw Hla, B.A., B.L., S. D. O., Minbya.
 Purser, Rev. W. C. B., Principal, St. Michael's S. P. G. School, Kemmendine.
 Pwa, Sya, Burmese Tutor, University College, Rangoon.
 *Reddiah, Rao Sahib S. Ramanatha, 63, 32nd Street, Rangoon.
 Reynell, C. A., Deputy Inspector-General of Police, Southern Range, Rangoon.
 Reynolds, H. O., I.C.S., Secretary to Govt. of Burma.
 Reynolds, J. T. C., Superintendent of Excise, Pegu.
 Robbin, U, Deputy Inspector of Schools, Myitkyina.
 *Roberts, Major A. B., Deputy Commissioner (retired).
 Robertson, L. C., 21, Boundry Road, Rangoon.
 Robertson, J. E. W., P. A. to D. I. G. of Police for Railways & C. I.D., Burma.

- Rodger, A., O.B.E., President, Forest Research Institute & College, Dehra Dun.
- Rollo, W. Smith, Agricultural Engineer to Govt., Mandalay.
- Ross, Dr. G. R. T., M.A., D. Phil., University College, Rangoon.
- Roy, M. K., Pleader, Pyapon.
- Russell, Rev. Maurice H., Wesleyan Methodist Mission, Mandalay.
- Rutledge, The Hon'ble Sir Guy, M.A., *Bar-at-Law*, Chief Justice, High Court of Judicature, Rangoon.
- Sa, U Po, I.S.O., K.S.M., Thaton.
- St. Guily, The Very Rev. Father, "Clergy House" Judah Ezekiel Street, Rangoon.
- Salarak, Phra Phraison, Siamese Agent & Forest Officer, Commissioner Road, Moulmein.
- Saung, U Po, Pleader, Toungoo.
- Saw, H. Po., B.A., Additional District Magistrate, Pyapon.
- Scott, G. E., East India United Service Club, 16, St. James Square, London, S. W.
- Searle, H. F., B.A., I.C.S., Joint Registrar, Co-operative Societies, Rangoon.
- *Sein, U Ba, c/o Chief Engineer, Burma Railways, Rangoon.
- Sein, Ma Mya, 2, Pagoda Road, Rangoon.
- Sein, U Po, A.T.M., Deputy Inspector of Schools, Rangoon.
- *Seppings, F. H., 2, Short Street, Kemmendine.
- *Set, U. B.A., Deputy Accountant-General, Burma.
- Sewell, Lieut.-Col. J. H., 6, Bagaya Phoongyee Road, Kemmendine.
- Shaw, J., Assistant Superintendent, Namhsan, N. S. S.
- Shein, U Ba, Pleader, Pyapon.
- Shields, D., Head-master, St. Luke's School, Toungoo.
- Shin, U Ba, Judicial Minister, Yawngghwe State, S. S. S.
- Shwe, U San, F.R.G.S., 64, Creek Street, Rangoon.
- Sin, U Po, E. A. C. (retired), Bazaar Street, Prome.
- Sit, U Po, Pleader & Municipal Commissioner, Tharrawaddy.
- Sloss, D. J., C.B.E., Principal, University College, Rangoon.
- Smith, J. R. Baird, Irrawaddy Flotilla Co., Ltd., Rangoon.
- *Smith, H., Burleigh, Wellington, Shropshire.
- Smyth, W. J., B.A., I.C.S., Deputy Commissioner, Sandoway.
- *Snow, C. A., M.A., Director of Public Instruction, Burma.
- Stainer, S. F., 3/20 Burma Rifles, c/o Messrs. A. Scott & Co., Rangoon.
- Stamp, Dr. L. D., B.A., D.Sc., F.G.S., London School of Economics and Political Science, London, W. C. 2.
- *Stewart, J. A., M.A., M.C., I.C.S., Deputy Commissioner, Thaton.
- Street, W., Deputy Commissioner, Henzada.
- †Stuart, J., Ivy Bank, Liberton, Midlothain, Scotland.
- Su, Maung, c/o Prof. Rathstein, Pariser Str., 3, Berlin, W. 15.
- Su, U, *Bar-at-Law*, China Street, Mandalay.
- Sulaiman, Meer, M. A. Student, University College, Rangoon.
- *Sultan, M., Landlord and Merchant, 56, 37th Street, Rangoon.
- Surty, C. M., Merchant, 45, Park Road, Rangoon.
- Sutherland, C., S. D. O., Thayetmyo.

- *Swan, U Boon, Pleader, Pyapon.
 Swe, (2) U Ba, B.A., S. D. O., Kyauktan.
 Swe, U Chit, Junior Assistant Registrar, Co-operative Societies, Mandalay.
 Swinhoe, R., Solicitor, Mandalay.
 *Swithinbank, B. W., I.C.S., Deputy Commissioner, Pegu.
 *Symms, J. M., M.A., I.E.S., Assistant Director of Public Instruction, Burma.
 Tapa, James, M.A., Lecturer, Judson College.
 *Taylor, L. F., B.A., I.E.S., Research Lecturer, University College, Rangoon.
 Te, Rev. Ba, A. B. Mission, Taunggyi, S. S. S.
 †Temple, Sir Richard Carnac, Bt., C.B., C.I.E., F.S.A., c/o Messrs. H. King & Co., 9, Pall Mall, London, S. W.
 Teong, Taw Sone, B.A., B.A.G., Superintendent, Agricultural Farm, Mandalay.
 Tha, U Ba, B.A., Treasury Officer & Headquarters Magistrate, Magwe.
 Tha, U Po, Lecturer, Intermediate College, Mandalay.
 Tha, Capt. R. R. H. O., I.M.S., c/o Messrs. A Scott & Co., Rangoon.
 Tha, U (2), Shwe, K.S.M., Myingyan.
 Than, U Aung, B.A., Subdivisional Officer, Kyauktaw, Akyab District.
 Than, U Ba, Township Officer, Kyaunggon.
 The, U Po, Additional District Magistrate, Moulmein.
 Thein, U Ba, B.L., 72A, Phayre Street, Rangoon.
 *Thein, Saya, Hmawbi (Insein).
 Thi, U Ba, Income-tax Officer, Rangoon.
 Thin, U, Pleader, Pyapon.
 Thin, U Ba, Deputy Commissioner, Minbu.
 Thin, (2), U Po, E. A. C., Additional Magistrate, Bassein.
 Thin, (1), U Po, K.S.M., A.T.M., E. A. C. of Forest, Naba (Katha).
 Thin, U Po, Deputy Superintendent, Civil Veterinary Department, Sagaing.
 Thon, U Po, B.A., Assistant Lecturer in Mathematics, University College, Rangoon.
 Thoo, U San, Rice Miller, Honorary Magistrate, Kwelwe, (Myaungmya.)
 Thwin, J. B., R.A., Treasurer, 121, Strand, Ma-ubin.
 Tin, (5), Maung Headquarters Assistant, Shwebo.
 *Tin, Prof. Pe Maung, M.A., B.Litt., I.E.S., University College, Rangoon.
 *Tin, U, A.T.M., K.S.M., 52, Creek Street, Rangoon.
 Tin, U Hla, Akunwun, Pakokku.
 To, U Saw Po, Deputy Inspector of Schools, Thaton.
 *Tripp, L. M. G., c/o Messrs. Fabricius & Co., Pakokku.
 *Tsain, U, *Bar-at-Law*, Pegu.
 *Tun, Dr. Aung, M.B., Ch.B., Civil Surgeon, Pegu.
 Tun, U Ba, Township Officer, Chaungzon.
 Tun, U Ba, Headquarters Assistant, Mergui.
 Tun, U Po, E. A. C. of Forests, 27, Godwin Road, Rangoon.
 Tun, U Thet, 25, Prome Road, Rangoon.
 Tway, U Chit, Inspector of Police, Pyu, (Toungoo).
 U, U Tun Hla, Resident Excise Officer, Maungdaw (Akyab).

- U, U Kyaw Zan, Miller, Akyab.
 Vardon, S. D., Advocate, C Road, Mandalay.
 Verhage, A., Merchant, Messrs. Massink & Co., Ltd., Rangoon.
 †Waley, A., Department of Prints and Drawings, British Museum,
 London, W. C. 1.
 Walters, Rev. H. C., W. M. M. High School, Mandalay.
 *Ward, K. M., University College, Rangoon.
 *White, Sir Herbert Thirkell, "The Cottage", St. Ives, Cornwall.
 Whiting, H. N., Nandawgone, Meiktila.
 Wilkie, H. G., I.C.S., c/o Messrs. A. Scott & Co., Rangoon.
 *Williamson, A., M.A., I.C.S., Deputy Chairman, Rangoon Development
 Trust.
 *Wilson, I. D., Lecturer, Engineering Institute, Insein.
 Win, (2), U Po, Akunwun, Mergui.
 Wischam, Miss M. R., "Roslyn", Promé Road, Rangoon.
 *Woods, E. A., Commander, Irrawaddy Flotilla Co., Ltd., Rangoon.
 Wun, U So, Junior Assistant Registrar, Co-operative Societies, Meiktila.
 Ya, U Tun, A.T.M., K.S.M., Deputy Commissioner, Myaungmya.
 Yah, U Kyaw, Subdivisional Police Officer, Myanaung.
 Yain, The Hon'ble Mr. L. A., Minister to the Govt. of Burma.
 *Yee, U Po, Rice Miller, Hony. Magistrate, 3, Edward Street, Rangoon.
 Yin, U Ba, Subordinate Judge, Myaungmya.
 Yin, U Tun, Township Officer, Daik-u.
 Yin, U Tun, Head-master State Anglo-Vernacular School, Namtu.
 Zahur, Mohamed, Government High School, Akyab.
 Zan, U Ba, Subdivisional Officer, Meiktila.
 Zan, Abraham Shwe, Deputy Inspector of Schools, Moulmein.
 Zan Saya, Head-master, R. C. M. School, Thonze.

OBITUARY.

1926.

- U Tun Nyein.
 U Lun Maung.
 U Ba Thi.
 U Po Byu.
 The Hon'ble U May Oung.

If you wish to become a member or to propose a friend for membership, you are requested to sign the attached slip and forward it to the Hon. Secretary. If not, please pass on the forms to one of your friends.

BURMA RESEARCH SOCIETY.

Patron:

HIS EXCELLENCY THE GOVERNOR OF BURMA.

THE BURMA RESEARCH SOCIETY was founded in 1910. Its objects are the study and encouragement of Art, Science, History and Literature in relation to Burma, and the promotion of intercourse between members of different communities with a common interest in such objects. Meetings are held periodically at University College, Rangoon, at which papers are read. The principal work of the Society is the publication of a Journal, which appears thrice a year and is supplied free of charge to members. Articles by well-known scholars such as Messrs. C. O. Blagden, C. Duroiselle and R. Halliday have appeared in the Journal, but the Editor is chiefly dependent for contributions on Burmese and English members of the Society stationed in various parts of Burma. The articles are mostly on Burmese history, archaeology, literature, art, language, philosophy, religion and folklore. They are of interest not only to scholars but also to general readers who are attracted by Burma and its people. The Editor welcomes contributions from members who have made a study of any special subject or locality. Illustrated articles and articles in Burmese are always welcome. Apart from its Journal, the Society is also publishing Burmese literary and historical works and translations, and in this branch of its activity enjoys the assistance of the best Burmese scholars. It possesses a growing library for the use of members.

The Society is dependent for its funds entirely upon the subscriptions of members. The subscription is Rs. 15 yearly, payable in advance, or a single sum of Rs. 150.

The Society invites applications for membership. Anyone who desires to join, may ask a member to propose him, or may write to the HONORARY SECRETARY, BURMA RESEARCH SOCIETY (Bernard Free Library), RANGOON. The attached form may be used.

To

THE HONORARY SECRETARY,

Burma Research Society,

(Bernard Free Library), RANGOON.

* I propose for election as a member of the BURMA RESEARCH SOCIETY the name of.....Designation.....Address.....

* I desire to be elected a member of the BURMA RESEARCH SOCIETY.

Name.....

Designation.....

Address.....

* Delete as circumstances require.

1. The first part of the document is a list of the names of the persons who have been appointed to the various positions of the Board of Directors of the Corporation. The names are listed in alphabetical order, and each name is followed by the position to which he or she has been appointed.

THE
GLASS PALACE CHRONICLE
OF THE
KINGS OF BURMA
(HMANNAN YAZAWIN).
TRANSLATED BY
PE MAUNG TIN
AND
G. H. LUCE,

PUBLISHED BY THE OXFORD UNIVERSITY PRESS
FOR THE TEXT PUBLICATION FUND OF THE BURMA RESEARCH SOCIETY

The *Glass Palace Chronicle*, the most important of the native histories of Burma, was compiled in 1829, by a committee of scholars appointed by King Bagyidaw of Burma, who based their work on earlier chronicles, inscriptions, and other ancient records.

The present translation omits the first two parts of the Chronicle, as they merely retell the story of Buddhism and of the Buddhist kings of Ancient India, and begins at the point where the story moves to Burma. The third part opens with the history of the three Burmese kingdoms of Tagaung, Tharehkittara and Pagan. The fourth and fifth parts of the present volume cover perhaps the most interesting period of Burmese history, that of the kingdom of Pagan—the city on the middle Irrawaddy, a hundred miles below Mandalay, whose noble temples and vast ruins still astonish visitors. The volume closes with the fall of Pagan (1287 A.D.), consequent on the invasion of Burma by the armies of Khublai Khan. It is hoped that the response to this publication will justify the Burma Research Society in continuing the translation and adding notes in subsequent volumes.

ORDER FORM FOR MEMBERS ONLY.

**Special Reduced Price for Members of the B. R. S. Rs. 5 per copy
(in paper covers).**

To

**THE HONORARY SECRETARY,
Burma Research Society,
(Bernard Free Library), RANGOON.**

DEAR SIR,

I am a member of the Burma Research Society. Please send
me.....^{copy}_{copies} of the translation of the Glass Palace Chronicle
V. P. P.,
for which I enclose the sum of Rs.....

Name.....

Designation.....

Address.....

JOURNAL OF THE BURMA RESEARCH SOCIETY.

Vol. XVII, Part II.

C O N T E N T S .	PAGE.
1. Lecture on the Dictionary by J. A. Stewart, Esq., I.C.S. ..	105
2. Some Notes on "A Burmese Phonetic Reader," by H. O. Reynolds, Esq., I.C.S.	119
3. Geography of South Tenasserim and the Mergui Archipelago, by H. L. Chhibber, Esq., M.Sc.	127
4. A Prosodic Note on Aṣvaghosa's Buddhacarita by P. G. Gopalakrishna Iyer, Esq., M.A.	157
5. K'ala Language by H. I. Harding, Esq.	165



THE BURMA RESEARCH SOCIETY.

(FOUNDED 1910)

For the Study and Encouragement of Arts, Science, History and Literature in relation to Burma.

PATRON.

HIS EXCELLENCY SIR SPENCER HARCOURT BUTLER,
G.C.I.E., K.C.S.I., I.C.S.

COUNCIL.

President.

THE HON'BLE SIR J. G. RUTLEDGE, KT., K.C., M.A., *Barrister-at-Law**

Vice-Presidents.

U SHWE ZAN AUNG, A.T.M., K.S.M.
THE HON'BLE MR. Justice U BA, B.A., K.S.M.
J. S. FURNIVALL, ESQ., B.A., I.C.S., (Retired).

Honorary Secretary:

U E MAUNG, M.A., LL.B., *Barrister-at-Law**

Honorary Treasurer.

A. CASSIM, ESQ., B.A.*

Honorary Editors and Librarians.

PROF. PE MAUNG TIN, M.A., B.LITT., I.E.S.*
PROF. F. J. MEGGITT, M.Sc., Ph.D., I.E.S.*

Executive Committee.

THE HON'BLE MR. JUSTICE	PROF. D. G. E. HALL, I.E.S.*
U MYA BU, <i>Barrister-at-Law</i>	S. G. Grantham, ESQ., I.C.S.
U TIN, K.S.M., A.T.M.	W. G. FRASER, ESQ., I.E.S.
L. F. TAYLOR, ESQ., M.A., I.E.S.	C. W. DUNN, ESQ., C.I.E., I.C.S.
DR. G. R. T., ROSS, I.E.S.	G. H. LUCE, ESQ., B.A., I.E.S.
U PO SEIN, A.T.M.*	D. B. PETCH, ESQ., I.C.S.
U TUN PE, M.A.*	U SET, B.A.
D. J. SLOSS, ESQ., M.A.	PROF. W. N. ELGOOD, I.E.S.

General Committee.

J. L. McCALLUM, ESQ., I.C.S.	R. C. J. SWINHOE, ESQ.
U THEIN	SAN SHWE BU, ESQ.
MAJOR C. M. ENRIQUEZ.	CH. DUROISELLE, ESQ., M.A.
U KYI O, B.A., A.T.M., K.S.M.	U THA TUN AUNG, B.A.
TAW SEIN KO, ESQ., C.I.E.	J. A. STEWART, ESQ., I.C.S.
H. F. SEARLE, ESQ., I.C.S.	U HLA, B.A.
Dr. O. HANSON.	U THA KIN.
G. E. HARVEY, ESQ., I.C.S.	

*Members of the Sub-Committee.

LECTURE ON THE DICTIONARY.

Delivered at a General Meeting of the Society on 4th September 1926.

Many of my audience know all that is to be known about the history of the scheme for the production of a new Burmese Dictionary. Mr. Furnivall delivered a lecture in this building some 6 months ago, which lecture is published in the Journal of the Burma Research Society for April 1926, and so I shall ask anyone who wishes for any purely historical information to refer to that number of the Journal. I must not omit to mention, however, that the dictionary owes a debt of gratitude to three public bodies which we can never too often acknowledge—the Burma Research Society who financed the Dictionary Sub-Committee in the early days, the Government of Burma who have made a very generous allotment which frees the Sub-Committee from any financial anxieties for the next 4 years, and the Rangoon University which is not only co-operating whole-heartedly with us but to whose good offices in other respects we are under deep obligations. The Dictionary Sub-Committee consists at present of the following:—

U Tin, K.S.M., A.T.M., late of Pagan,
Mr. C. W. Dunn, C.I.E., B.A.,
Mr. Ch. Duroiselle, M.A.,
Prof. Pe Maung Tin, M.A., B.Litt.,
U Kyi O, B.A., K.S.M., A.T.M.,

with myself as Secretary or Executive Member. My predecessor was Mr. H. F. Searle, whom we shall welcome back on the expiry of his leave and who, I hope, will resume part at least of his former duties. It is in the capacity of Secretary of the Sub-Committee that I have the honour to address you this evening. Besides reporting the progress hitherto made, I will take the opportunity of explaining, with the aid of the magic lantern kindly lent to us by the Y. M. C. A., the method of collecting materials, the principles on which words are selected for record and the best manner of record. There is one important branch of the work with which I have practically nothing to do. This is the examination and collection of material from inscriptions and other archaic and unpublished sources which is in the hands of the University and is being dealt with under the direction of Professor Pe Maung Tin. This part of the undertaking is immensely important, if only that thereby we hope to supply a defect which, you remember, Stevenson regretted—we hope to produce an etymological dictionary.

You will please therefore remember that the Sub-Committee is directly concerned only with what may be called modern literature and with the spoken language. The first set of Instructions to Collectors

attempted to deal with collections from both these sources. The latest edition treats the two sources separately. I will refer to important points in these instructions as the slides are thrown on the screen. Meantime I should like to say that they were drawn up after consultation with scholars at home, including some actively engaged in dictionary work. We may take it, therefore, that their basis is sound and that the work of collection was on the right lines from the start.

Beginning from the end of last year books were issued to all who undertook to read for the dictionary. Out of 59 who gave the undertaking, nothing has been heard from 32. 27 have done something. 10 are competent and fairly regular collectors and 10 are first class.

I think I may say that interest is awakening. I have recently had offers of help from a learned aggamahapandita and several other persons, and a request to open a class of instruction in Thaton.

I will now give some statistics showing the amount of work done. I have in my hands some 9,000 slips. Many of them record words which do not appear in any of the editions of Judson's dictionary. Many more contain usages which are not given there and all of them contain valuable illustrative extracts, a feature in which all editions of the dictionary are deficient. In Stevenson's edition there are less than 1200 pages, so that with the materials already collected we could make between 7 and 8 valuable additions to every page. I think I am safe in saying that this would constitute a more notable advance than any previous revision. The work of collection started, as I said, in the end of last year. By the end of December 1925 we had 1,200 slips. Since then the monthly average has been close on 1,000. At this rate, at the end of 4 years, we should have some 50,000 slips. Even then we might not have covered the whole range of Burmese literature, we might not be able to produce the perfect dictionary—but I do not think there is anyone who would dispute that with that amount of material, we could go to press, not with a revision of the old, but with a new dictionary. We ought, however, to aim as high as possible, and I shall make some suggestions by and by for increasing our output.

So much for progress up to date. I feel it is time I were getting on to the practical part of my lecture but if you will bear with me a little longer I should like to explain the ideal of a dictionary which the Sub-Committee and, I may say, the contributors, have before them. I cannot do this better than by referring you to the new edition of Liddell and Scott's Greek dictionary which is appearing in parts and of which the first part has already appeared. Take the word "athreo" meaning 'to look', more or less corresponding to the Burmese 'ဝေ့'. You find the uses of the word classified under several numbers. In each case the meaning is given followed by one or more illustrations. The

first meaning given is 'to gaze at' or 'observe'; next 'to inspect'; the next meaning is 'to look earnestly'; next comes a metaphorical use 'to observe mentally', 'consider' and finally you get a rare use 'to perceive', 'to hear' as of a sound. Altogether under this word 'athreo' the dictionary gives 21 quotations and a number of other references to which no quotations are attached.

It may be interesting to consider the Burmese word 'ကြည့်'. How should we classify its meanings? We cannot really say until we get records of its various uses from collectors. Its first meaning of course is 'to look at', 'to look on' as at a *pwè*, 'to be one of the audience'. Then we have idiomatic uses like 'ကြည့်စမ်း' in which the meaning is not or not always 'to look at' but rather 'to bring the mind to bear' on a certain subject. Then we have a use which is a wide departure from the original meaning 'to look after', 'to protect the interests'. Then there is a meaning which is very common in colloquial. It is something like 'to use one's discretion' 'ကြည့်ပြီးတော့လုပ်မယ်'—'I won't go baldheaded at it. I will take such action as is advisable in the circumstances'. I don't suppose we have yet exhausted the meanings of 'ကြည့်' but you will realise now what scurvy treatment it receives in the latest edition of the dictionary where it is disposed of in one line—'ကြည့်', verb, 'to look, look at, behold'.

Now a Burman or other person who knows Burmese well, may say "What is the good of a dictionary classifying all the meanings of 'ကြည့်' and giving illustrations? What is the good of it to me? I know all about it without referring to the dictionary". To these criticisms I would reply that they do not represent a scholarly or scientific attitude of mind. There should be for every language a dictionary which forms a complete record of it. No botanist would omit to describe a daisy because it is a common plant which everybody recognizes.

But I am prepared to carry the war into the enemy's country. I say that Burmese words are very commonly misused. You know the word *နှစ်လုံးပြူး*: 'a double barrelled gun'. The word *ပြူး* means 'coupled together'. Yet people talk of a *တလုံးပြူး* meaning 'a single-barrelled gun.' Another instance: U Tin of Pagan in one of his books tells how he asked a Burman assistant or broker in one of the firms what his occupation was. The man said သူငွေများနှင့်ဆန့်ကျင်ဘက်လုပ်သည်. This could only mean that he obstructed his employers, which may have been the fact, but U Tin elicited from him that he intended, at least, to serve them.

This slide represents a passage from one of U Ponnya's plays called "The Waterman". We will suppose it was allotted to a reader and that the subsequent slides are the slips on which he makes his entries. The passage was selected largely because it was all on one page and not too long to be reproduced on a magic lantern slide. The heroine, a waterwoman, is about to set out on her daily rounds. The general meaning

of the passage is quite clear and almost any Burman reading it over and carried on by the interlinking rhymes will think when he comes to the end that he has understood it completely. But if you take him through it carefully, line by line, he will, I think, admit that it contains a good many puzzles, in the shape of difficult words or words used with a twist. We, however, are not collecting materials for a dictionary of difficult words. Our dictionary aims at being a complete record, or as complete a record of the language as possible.

မြို့တောင်မျက်နှာက၊ ရေရောင်းမိန်းမထွက်ဆိုရန်စကား။

ဪ၊ ဗာရာမည်ခေါ်။ သည်ပြည်တော်မှာ။ အကျော်စေတ။ ခေါင်မှာစွဲအောင်။ ဝှံ့တေလှတ။ ကျွန်မကို
ငယ်။ တခါတရံ။ လောကဓမ္မာ။ ကံမျက်စိလယ်လို့မှ။ ပြောင်နိုင်တယ်မရှိ။ ရေရွက်လို့ရောင်း။ ဝမ်းကိုကျောင်းရ
တယ်။ ခေါင်းကိုးလို့ယိခွဲပြီ။ ပစ်တဘက်။ ပြောင်းတဝက်နှင့်။ ဆန်ပြက်သိကာ။ ပါကောင်းရုံပါတော့တယ်။ ဟင်း
လျာကံပီလော။ လည်ချောင်းကိုမြေလှန်။ ဂလိုဆန်အောင်။ စုံကန်လို့မျှောရတယ်။ ကောလိုက်တဲ့ကံ။ မရင်းဆန်
နှင့်။ ပွဲချဉ်ပေါင်။ ကျွေးနိုင်တဲ့မောင်မျိုးကို။ ကံဆောင်လို့တခါ။ ငြိမ်းချင်ပါဘိ။ ဇာတာထွန်းပေ။ နတ်နှိုးဆော်
လို့။ မတော်တဆ။ မရင်းမောင်မောင်။ ဦးချဉ်ပေါင်တို့နှင့်။ အိမ်ထောင်များကျခါမှ။ ဝတ်ကြီးဘောင်းလန်အောင်။
ဝမ်းစည်းစိမ်းတော့မယ်။ ဪ တောင်ကြိမြောက်ကြိ။ မမှန်တောက်တီး။ ဆင်းရဲခန်းကို။ နိဒါန်းသွယ်လို့။ ဘယ်
နှယ်ပင်ညည်းကတံ။ ဆန်နီးမယ်မဟုတ်။ ရေကြပ်ကြပ်ရောင်းနိုင်မှ။ ပြောင်းဆန်ကိုကုပ်မိတယ်။ စုတ်ပေတောင့်
ထမိန်။ အစပ်ကတရာ။ အဓါကဘရပြစ်။ ပြောင်ကျအောင်ညစ်ပါတဲ့။ ပဆစ်အိမ်ကို။ သုံးလွန်းလိမ်ခါးတင်ထိုး
လို့။ ရေအိုးကိုရွက်။ မူရာတော်နွဲ့နွဲ့နောင်းမှာ။ ရေချိုရောင်းထွက်တော့မည်။ ကိုးမျက်စုံဝိုင်းလယ်က။ ရေသည်
ကိုနေမြင့်ရအောင်။ အိုးပင့်တော်မူလိုက်ပါ။ မောင်ကြီးရှင့်။

Heigho !

In all Benares I and none but I
Stand on the very peak and pinnacle
Of destitution. Nor does fortune ever—
As by mistake or favour unforethought—
Send me a silken gown for holidays.
I hawk and hawk fair water for a living
Till my poor head is blistered neath the pot.
My food is beans and millet and a pinch,
The merest pinch of rice ; for curry stuff,
Pilaw. And when I swallow it, it does
Rasping and raking all my throat, that I
Must stick my heels out, so, and swill it down
Until I'm fairly bubbling. What a life !
Oh ! if some youth who'd treat me to a spread
Of mayin rice and chinbaung were by chance
To come my way, how I should love to meet him !
And wouldn't it be a bit of luck to marry
Some Maung Mayin or even Uncle Chinbaung.
My, wouldn't I guzzle.

But this will never do,
Dreaming the day away and running on,
Making a song about my poverty.

LECTURE ON THE DICTIONARY.

Grumbling won't bring me to a meal of rice
And millet's earned by selling water for it.
So I'll tuck up my tattered old taminein,
Glossy with wear, a thing all seams and stitches,
So patched and particoloured it might be
A chequer-board. And then with pot on head,
See me go mincing it along the street
Crying my wares. Now strike me up a tune,
You, brother, there amid the jewelled drums,
To help me lift my water-pot and speed me
Well on my way before the sun be high.

Benares.

(contraction for မာရာဏသီ)

မာရာမည်ခေါ်လည်ပြည်တော်မှာ။

Yethe, 9-7.

Notoriously.

အကျော်စေ၊ ခေါ်မှာစွဲအောင်၊ ခွဲတေလှတဲ့။

(? စေ = ဇေရ)

Yethe, 9-7.

Summit.

ခေါ်မှာစွဲအောင်၊ ခွဲတေလှတဲ့။

Yethe, 9-8.

Worldly conditions
(Pali lokadhamma.)

တခါတရံ၊ လောကဓမ္မာ၊ ကံမျက်စိလယ်လို့မှ၊ ပြောင်
နိုင်တယ်မရှိ။ Not even once in a
way from Fortune having lost
her road among the things of
this world, am I able to dress
well.

Yethe, 9-9.

To be well dressed.

ပြောင်နိုင်တယ်မရှိ၊ ရေရှက်လို့ရောင်း။

Yethe, 9-9.

To feed.

I feed myself, I make my living.

ရေရှက်လို့ရောင်း၊ ဝမ်းကိုကျောင်းရတယ်။

Yethe, 9-10.

မာရာ

အကျော်စေ

ခေါ်

လောကဓမ္မ

ပြောင်

ကျောင်း

ကျိန်း

To be sore from friction.

ရေရှက်လို့ရောင်း။.....ခေါင်းကျိန်းလို့ယိခဲ့ပြီ။

Yethe, 9-10.

To ulcerate.

ခေါင်းကျိန်းလို့ယိခဲ့ပြီ။

Yethe, 9-10.

A very little, a pinch.

(Stevenson writes ဖျက်)

ပဲစိတဘက်၊ ပြောင်းတဝက်နှင့်၊ ဆန်ပြက်သိကာ။

Yethe, 9-14.

Perhaps.

ဆန်ပြက်သိကာ။ ပါကောင်းရုံပါတော့တယ်။

Without ကောင်း meaning would be--
there is always some rice, though
only a little. ကောင်း implies that
there is sometimes no rice at all.

Yethe, 9-11.

Raw material, stuff.

ဟင်းလျာကပီလော။

(Cf. Manikondala page 19. ညဦးက
စားတော်လျာအမဲစီရင်၍ထားရ၏။

Yethe, 9-12.

ဟင်းလျာကပီလော

(Mentioned as an inferior kind of
curry stuff.)

Yethe, 9-12.

ပီလော

မြေလှန်

To trench, turn over soil.

လည်ချောင်းကိုမြေလှန်။

(Coarse food lacerates the throat.)

Yethe, 9-12.

ဝလံ

A bubble (? ဗလံ)

ဝလံဆန်အောင်စုံကန်လို့မျှောရတယ်။

I have to thrust my legs out and wash down my coarse food until the bubbles rise.

Yethe, 9-12.

စုံ

Both together.

စုံကန်လို့

Thrusting or kicking out both feet.

Yethe, 9-13.

မျှော

To wash down.

ဝလံဆန်အောင်စုံကန်လို့မျှောရတယ်။

(= ကျိုက်ချ. for which it appears to have been used for the sake of the rhyme.)

Yethe, 9-13.

ကော

To rise up ; to bulge ; to form a sand bank.

ကောလိုက်တဲ့ကံ။

What an obstructive fate is mine !

Yethe, 9-13.

ပွဲ

Meal ? " spread."

မရင်းဆန်နှင့်ပွဲချင်ပေါင်း။ ကျွေးနှိုင်းတဲ့မောင်များ။

Any young man who can afford to feed me well.

Yethe, 9-14.

ဆောင်

To bring.

ကျွေးနှိုင်းတဲ့မောင်များကို ကံဆောင်လို့တခါ။ ကြိုစမ်းချင်ပါဘိ။

Any young fellows whom my fate brings along

Yethe, 9-14.

စမ်း

To try, to experiment.

ကျွေးနှိုင်းတဲ့မောင်များကို.....ကြိုစမ်းချင်ပါဘိ။

I should like to have the experience of meeting.

Yethe, 9-15.

ဇာတာ

Luck depending on the influences under which one is born.

ဇာတာထွန်းပေါ်

Yethe, 9-15.

မတော်တဆ။

Perhaps by chance.

မတော်တဆ။ မုရင်းမောင်မောင်။ ဦးချင်ပေါင်းတို့နှင့်။

အိမ်ထောင်များ ကျခါမှ။ ဝဝကြီး ဘောင်းလန် အောင်၊ ဝမ်းစည်းစိမ်ခံတော့မယ်။

Yethe, 9-15.

Or something.
အိမ်ထောင်များကျခါမှ။
(များ makes the possibility more remote. Cp. Wizayazat Shwe Kyu's Edition, page 19. 'ယနေ့များ ချော်ရင်လ။ If I were to miss him to-day.)

Yethe, 9-16.

To be distended and throw one's
body back.
ဝတ်ကြီးတောင်းလန်အောင်။ ဝမ်းစည်းစိမ် ခံတော့
မယ်။

Yethe, 9-17.

Thinking of this and that.
တောင်ကြံ မြောက်ကြံ။ မမှန်တောက်တီး။

Yethe, 9-18.

Disconnectedly.
မမှန်တောက်တီး။ ဆင်ရဲခန်းကို နိဒါန်းသွယ်လို့။

Yethe, 9-18.

Chapter.
ဆင်းရဲခန်းကို နိဒါန်းသွယ်လို့။

Yethe, 9-18.

Subject; story.
ဆင်းရဲခန်းကို နိဒါန်းသွယ်လို့။
Enlarging on the subject of my
poverty.

Yethe, 9-19.

To draw out.
(Figuratively) နိဒါန်းသွယ်လို့။

Yethe 9-19.

No matter how.
ဘယ်နှယ်ပင်ပြီးကတည်း။

Yethe, 9-19.

To hold firm.
ရေကြပ်ကြပ်ရောင်းနိုင်မှ။ ပြောင်းဆန်ကို ကုပ်မိတယ်။

Yethe, 9-20.

Intensive suffix.
စုတ်ပေ။

Yethe, 9-20.

Intensive particle.
စုတ်ပေတောင့်တမိန်။

Yethe, 9-21.

Swarming: one on top of another.
အစပ်ကတရာ။ အဓာကဘရပြစ်။

Yethe, 9-21.

To the point of.
ပြောင်ကျအောင်ညစ်ပါတဲ့။
Dirty to the point of glossiness.

Yethe, 9-21.

လွှန်း
A turn or twist.
သုံးလွန်းလိန်။
Yethe, 9-22.

ခါးတင်ထိုး
To shorten and tighten the skirt
at the waist. Shortening at the
waist, my draft broad pattern
skirt by turning it under three
times.
ပဆစ်ဒိမ်ကို။ သုံးလွန်းလိန်ခါး။ ဝင်ထိုးလို့။
Yethe, 9-22.

မူရာ။
Mien ; carriage.
မူရာတော်နွဲ့နောင်းမှာ။
Yethe, 9-23.

နွဲ့နောင်း
Supple.
မူရာတော်နွဲ့နောင်းမှာ။
Yethe, 9-23.

မျက်
Precious stone.
ကိုးမျက်စုံ
Yethe, 9-24.

ဝိုင်း
A circle.
ကိုး ကံစုံဝိုင်းလယ်။
From the middle of the ဆိုင်းဝိုင်း
Yethe, 9-24.

A knowledge of English is not in the least necessary for a collector. I will show you one or two slides containing words from the same passage from the 'Ye-the' with the meanings and explanations written in Burmese. It is obvious that these will be just as useful to the compilers of the dictionary as if part of the entry had been in English. After all it is only in exceptional cases that there is any doubt about the meaning of a word and what is wanted is the illustrative quotation.

သုံးလွန်းလိန်။
သုံးချက်လိပ်။ သုံးကျော့လိပ်။
စုတ်ပေ တောင်ထိန်..... သုံးလွန်း
လိပ်ခါးတင်ထိုးလို့။
ရေသည်။ ၉-၂၂။

ဘရပြင်။
ပြင်တူကြို။ ကပ်၍ အပ်၍ ရှောင်သော။
အပ် ကတရာ၊ အခါကဘရပြင်။
ရေသည်။ ၉-၂၂။

It will occur to you to ask, "How can persons, who do not read English and are therefore unable to use the dictionary effectively, be put in the way of selecting the proper words for record?" Well, as a matter of fact, most of them can use the dictionary. And in practice, contributors develop an instinct which is a very reliable guide in selection of words.

The Dictionary Sub-Committee are very anxious to enlist the services of Burman scholars, and recognize that many of them are unfortunately in straitened circumstances, the market for scholarship in Burma being extremely limited. The Sub-Committee have therefore decided to offer small honoraria, which do not represent the full value of the work done but are in the nature of *Nyanpuzaw* for what is, to a real scholar, a pleasing exercise of his trained faculties. We also owe to a generous well-wisher a number of copies of the dictionary for issue to those who could not afford to buy them.

Besides literary sources valuable materials are obtainable from Burmese Newspapers and from the spoken languages. I will show a few slides collected from one or 2 numbers of the "Sun" Newspaper and of words or usages not in the dictionary which I have myself heard. A separate set of instructions have been prepared are collection of colloquial words. The principles to be applied are exactly the same as in the case of collection from literary sources, the full context and the reference—in the case of colloquial words, the locality and sex of the speaker have to be given. With a language like English in which the volume of literature is so enormous, it may be assumed that every word in use in the spoken language is to be found also in books. But I do not think that this is true of Burmese. If I am right it is very important that collection from the spoken language should go on *pari passu* with collection from literary sources. The labour entailed in recording a rare word when one hears it is very slight but the benefit to the dictionary will be great.

မိန်ညောင်

House lizard.

Dialectical form of မိန်မြောင်။

Mandalay E. Burman male.

ကံကျွေး

An assistant

ပန်းရန်ကံကျွေး။

An unskilled assistant to a mason, who carries bricks etc.

Mandalay male.

LECTURE ON THE DICTIONARY.

လန်

To throw one's head back.

ချဉ်လိုက်တာလန်လို့။

It is so acid as to make one
throw one's head back, draw
in one's breath.

Thaton. Burman male (general).

မျက်နှာကြီးရာဟင်းဖတ်ပါ။

Proverb.

မဟန်ဘုန်းကြီးကလဲ။ ဥစ္စာမနေပေါ့များနေတော့။
မျက်နှာကြီးရာဟင်းဖတ်ပါသွားမှာစိုးရသမျှ။
The solid morsels in the curry
go to the distinguished man ;
"to him that hath shall be
given."

The Sun, dated 1-4-26, p. 10.

ယပ်လဲ့။

Extempore.

ဘုန်းကြီးများ ယပ်လဲ့တရားဟောသလို။
The pongyi holds his fan up
when he is repeating passages
which he has committed to
memory. He drops it when
speaking extempore.

The Sun, dated 17-4-26, p. 17.

ငါတကောကော။

Egotistically, opinionated.

ငါတို့လုပ်တာ လုပ်ဆိုပြီး ရှေးမခပဲ။ ငါတ
ကောကောနေကြရင်။ ဘာဖြစ်နိုင်ပမလဲ။

The Sun, dated 24-4-26, p. 10.

အာက။

Praiseworthy.

ငွေဝယ်ကွန်လွတ်လင်ခွင့်ကိစ္စကြီးကိုဆောင်ရွက်
ကြတဲ့ မစ္စတာဘားနတ်ဆိုတဲ့ ပုဂ္ဂိုလ်ကြီးဟာ
လဲ။ ပြီလကုန်လောက်မှာ။ ဟူးကောင်းတောင်
ကြားက ထွက်ခွါပြီး..... အာသန်နယ်ခြား
အရပ်ဒေသများလဲ သွားလိမ့်အုံးမတဲ့။ အင်း
အာကယောက်ျားတွေပဲ။

The Sun, dated 25-2-26, p. 10.

You have now seen how simple the method of collection by slips is and you will probably retain an impression of the slides with the entries on them—never less than four.

The word,
The meaning,
The illustrative passage,
The reference.

Extra entries may be necessary if there is any doubt about the spelling or if a translation or explanation of the whole passage is required.

But though the manner of record is quite simple, the selection of words for record presents difficulties to readers at the start. I must confess that the Instructions alone have never conveyed quite the correct idea to a new reader. Yet after he has read five pages of his book (and had perhaps one or two arguments with the Secretary) he knows exactly what to collect. Let me try to tabulate the kinds of words wanted.

(1) All new words.

(2) All new usages of words. Examples မေတ္တဝေ and ဝန on the slides shown you.

(3) All new compounds or couplets.

(4) All adverbs of other than the regular type—these because it has been found that the meanings given in the dictionaries are unreliable and because it is expected that some of them will prove important for etymological purposes.

(5) All four-word groups. These are one of the elegancies of Burmese and the curious thing about many of them is that the meaning is more than the sum of the meanings of the constituent parts.

(6) Proverbial phrases.

(7) Idioms.

All this is quite simple. There is also not much difficulty in deciding which Pali words to record and which to ignore.

The instructions say, however, that a record should be made where no illustration or a poor illustration is given. We should perhaps recast this so as to read "A record should be made in cases where an illustration is really required and no illustration or a poor illustration is given". Thus ဝါ means "to fall" and we obviously don't want contributors to multiply slips recording the word in that sense. But for all or

LECTURE ON THE DICTIONARY.

nearly all the secondary senses illustrations are really necessary. Thus in the slide I showed you, in the phrase ပြောကြားအောင်ကြား means "to the point of" and had to be recorded. A word should be recorded even if the meaning is unknown. For example, ပိဇ္ဇာ just shown you on the slide is a vegetable to which I can put neither an English nor a scientific name*

One final suggestion. Words occur and recur and the collector has to exercise his discretion in selecting the most suitable illustration. That illustration is the best in which the meaning of the word is most clearly indicated by the context. But there is no objection to more than one being given for the same word or usage. The compilers in turn will have to exercise *their* discretion in selecting the best; and certainly in cases where there is any doubt about the exact shade of meaning, the more material they have to go on, the better dictionary they will produce.

I may just touch on one or two questions which have been discussed among the members of the Sub-Committee and among readers and which will have to be decided before the work of editing begins. I think I may say that opinion is in favour of

- (1) the inclusion of Burmese synonymns as well as English definitions, and
- (2) the indication of accepted modern pronunciation in phonetic script.

With all this apparatus and with its wealth of quotation the dictionary will inevitably be a bulky volume or volumes. But nothing less will satisfy the demand of scholars in general. Should there be a demand for a cheaper and less elaborate dictionary, it should not be difficult, from the materials provided in the larger work, to produce a purely Burmese edition or a concise edition for the use of schools or business offices.

J. A. STEWART.

* A member of the audience was able to supplement the ignorance of the lecturer.

SOME NOTES ON 'A BURMESE PHONETIC READER.'

(L. E. ARMSTRONG AND PE MAUNG TIN).

This scholarly work unquestionably takes place as the standard book of reference for the pronunciation of modern Burmese. The descriptions of the Burmese phonemes and tonemes are clear and the translations are a model of accurate transliteration. The only work on the same lines—R. Grant Brown's 'Half the Battle in Burmese'—was published by the Oxford University Press in 1910. Since the Phonetic Reader contains no reference to 'Half the Battle' one can only suppose that the authors of the former were unacquainted with the latter, in which case it is reassuring to find that their conclusions as to vowel and consonant sounds and as to tones should bear out so closely those of Mr. Grant Brown and Prof. Sweet.

It is important that the only two standard works on Burmese phonetics should be reconciled as far as possible, and an attempt made to decide where the advantage is where differences are irreconcilable. Where there are such differences the conclusions in 'Half the Battle' cannot be dismissed lightly in favour of those in the Phonetic Reader. Mr. Grant Brown had studied phonetics, and the description of sounds in 'Half the Battle' was made after full discussion with Dr. Sweet, then Reader in Phonetics in Oxford, before whom each sound was repeated by a Burman. The author of 'Half the Battle' was also conversant with the symbols used by the International Phonetic Association (which are those used in the Phonetic Reader). That he did not adopt these entirely is explained by the objects that he had in view, namely, while assigning to every different sound a different symbol, to deviate as little as possible from the Government system of transliteration (which is as nearly as may be a transliteration of the Burmese letters), and to use as few diacritical marks as possible.

Before proceeding to examine real disagreements to the sounds it will be well to clear out of the way apparent differences due to Grant Brown's non-adoption of the full I. P. A. symbols. The symbols è, e, [followed by a 't' as in 'et'] ă, and aw, are used in Half the Battle to represent the vowel sounds in ငဝ်, ငဝ်, အေဝ် and ငေဝ် instead of the I. P. A. symbols ɛ, ɛ, ə and ɔ, and the symbols t, k, ny, ng, sh and y to represent the consonant sounds in အဝ်, အဝ်, ညာ, ငါး, ရှင်, and ရ instead of the I. P. A. symbols ʔ, ʔ, ɳ, ɳ, ɲ and ɹ because they are included in the official transliteration system, and represent the sound required by unequivocal English symbols. Incidentally they are the nearest English equivalent of the Burmese letters. There is no substantial disagreement between the Reader and 'Half the Battle' in their description of the sound. And in the case of i, a, o, u and th, each of which may

represent two different sounds which are differentiated in the Phonetic Reader by the use of the symbols.

i and ɪ
a and ʌ
o and ɔʊ
u and ʊ
ə and ,

while explaining that the vowel sounds in ɔɪ, ɔɛ, ɔ ɪ, ɔɛ, ɔɪ, ɔɛ, ɔɪ, and ɔɛ, represented in the Reader by ɪ, a, ɔʊ and ʊ are not the same as the vowel sounds in ɪ, ɔ, ɪ and ɪ, nor the consonant sound in ɔɪ the same as that in the ɔ of ɔɔɔ, yet separate distinguishing symbols are rejected because every instance where they would be used is already distinguished—for anyone with an elementary knowledge of Burmese—by the Burmese word itself. Thus the sound represented in the Phonetic Reader by ɪ only occurs when a final ɔ or ɛ follows the vowel (expressed or implied) in Burmese, e. g., ɔɪ, ɔɛ, ɔɪ, ɔɛ, when the resulting sound is always that described against the ending 'it' in 'Half the Battle' and against ɪ in the Reader. Similarly no confusion can arise over the sounds represented in the Reader by a, ɔʊ, and ʊ which only occur before the final consonants ɔ, ɔ, ɛ, or ɔ. And with a very few exceptions ə becomes , only when it occurs in the middle of a compound or agglutination.

We now come to the sounds where there is a real conflict of authority. These are the final nasals, the aspirated s (ə), p (ə), t (ə) and k (ə), and the combination of the aspirated and unaspirated k (ə and ə) with y (ə or ə).

The Burmese letters ɛ (n) and ɔ (n or m) when found at the end of a syllable only occur after a pure vowel and the diphthongs ei and o (ov). The Burmese letter c (n or ng) occurs at the end of a syllable after the vowel i (ɪ) and the diphthongs ai (aɪ) and au (aʊ). They are represented, both in the official system and in 'Half the Battle', the two former by n (sometimes m before another n in compound words) and the latter by n or ng according as whether it follows a vowel or a diphthong. Thus Mr. Grant Brown gives the sound in ɔɪ (to vomit), ɔɛ: (to give change) and ɔɛ (to be startled) as corresponding with that in French *cannes*, with a note that the n is "somewhat more nasalized than in English". Later on, he says French scholars are warned that the final n does not merely nasalize the vowel as in French *an*, and that the English sound an is nearer. In describing the n sound in on, un and ein, Mr. Grant Brown refers to 'an', and 'Half the Battle' is clearly of opinion that the consonants at the end of an, in, on, un and ein are pronounced and that these syllables are not merely nasalized vowels. For the final ng (which occurs only after the diphthongs ai, au,) 'Half the Battle' gives the ng of the English word 'song'.

The Reader on the other hand does not distinguish between final nasals ၵ and ၶ after a vowel or after the diphthongs ei or o (ov) and the final nasal c after the vowel i (i) or after the diphthongs ai (ai) and au (av), where isolated words are concerned. The sounds in the Burmese words ၵၵ , ၵၶ , ၶၵ , ၶၶ or ၵၵၶ are all given as nasalized vowels or diphthongs and distinguished from the ordinary vowels by a diacritical mark ၵ thus paၵ , peiၵ , povၵ , piၵ , paiၵ , pavၵ . In the notes it is stated that the i in ei and ai is acoustically rather like n or ၵ and that the v in av is acoustically very like ၵ . Further on at p. 15, a very light pronunciation of final consonants is admitted, but only in compound words and expressions and never before a vowel. Throughout the text of the translations we find the Burmese final ၵ , ၶ , c (in connected expressions) printed before syllables commencing with b and p as m , before ၵ , d , l , ၶ and t as n and before k or g as ၵ , in which cases the use of the nasal vowel symbols as well as the nasal consonant symbol appears redundant. So that in actual practice the Reader admits a considerable use of final consonants, more than would be expected from the notes. Grant Brown on the other hand in a review of the Reader writes: "It is interesting to observe that the suppression of the final consonant and the substitution of a glottal check or nasalization have now been advanced to such pitch in Rangoon that it has been thought advisable to treat the process as complete, except that n and ng are retained when a consonant (other than y or w) follows immediately"

The second of the points at issue between the Reader and 'Half the Battle' is the position of the aspirate in the Burmese consonants ၵ , ၶ , ၵ and ၶ . The official transliteration ignores the difference between the aspirated and unaspirated forms, but the difference is vital, and a Burmese clerk transliterating ၵၵၶၵ into English will instinctively write Maung Hka or Maung Kha. Mr. Grant Brown while rejecting the full h (used for transliterating ၵ and ၶ by all three systems) uses the diacritical mark ၵ thus ၵk , ၵs , ၵt , and ၵp . In describing the sound, he agrees with the Reader that the aspirated consonants are very like the consonants k , p , t and s in English, but somewhat more strongly aspirated. The Reader describes them all as 'strongly aspirated'. Where the authorities differ is in that the Reader refers to the aspiration as an insertion of h between the plosion of the consonant and the beginning of the vowel' (thus kh , sh , th and ph .) Grant Brown argues that there is a great difference between the Burmese t and a t followed by an h , that the former is just as much a single sound as t , but is pronounced with a much more forcible explosion, the tongue being forced away from the gum or teeth by the breath which is driven against it from the throat simultaneously with the formation of the t , and that the combination of t and h should be reserved for a double sound.

And in any case, and whatever the conventions of phonetic symbols may be, the use of the symbols sh and th to represent to an English reader any sounds other than those in the English 'shin' and 'thin' must be an endless source of confusion, the more so when the sounds ordinarily represented in English by sh and th do occur in Burmese.

The third difference is on the pronunciation of the Burmese k, aspirated and unaspirated, in combination with y (ကျ၊ ကျ၊ ချ၊ ခ်). And here the difference is much less important than the agreement, for the Reader agrees with 'Half the Battle' in finally disposing of k and g as symbols for transliterating the first part of the sound. When 'Half the Battle' appeared there was a regular 'silly season' controversy in the papers round this point, but as the Reader's confirmation on this point has been received in silence, it is fair to assume that the point is now admitted. Perhaps it is time that the official system followed suit, and dropped the k and g. But here, as in so many other points of transliteration, there is no room for confusion to any one conversant with Burmese, as the pronunciation of the sounds represented by ky, gy, and ch in the official system never varies. 'Half the Battle' and the Reader agree that the initial sound in ကျ is t, but whereas Grant Brown follows this with a Burmese 'y' which is he says a true consonant, the Reader follows it with a ၫ which is an I. P. A. symbol and is, used by the Reader to represent ၫ (sh) in Burmese. Of this sound the Reader says "the learner should attempt to produce the sound of sh in English *ship* with the tip of the tongue touching the lower teeth, and with a little of the quality of the sound s introduced". If the learner manages all this while at the same time he remembers to articulate the t element with the blade of the tongue against the back of the teeth-ridge and the forepart of the hard palate he should do very well.

The Reader treats the Burmese tones very elaborately, and with a profusion of diacritical marks that is rather confusing. 'Half the Battle' deals with the tones in the simplest manner, and only distinguishes the 3 tones that are essential in distinguishing between different Burmese words and that are by distinguished different symbols in Burmese writing. But 'Half the Battle' does in effect admit a variation of the tones, which gives rise to the finer distinctions elaborated by the Reader, *vide* his notes on pitch, tone and stress (p. 13), on the variations of tone in certain terminal monosyllables (p. 13), and on the stress in groups of words (p. 14). The Reader on the other hand admits 'that it would be possible to speak Burmese intelligibly, giving to each syllable the tone it would have if pronounced in isolation i.e., pronouncing it with the principal member of the toneme, (the tonemes of the Reader correspond with the tones of 'Half the Battle') and ignoring altogether the subsidiary members, but goes on to say that 'it is necessary if the learner aims at acquiring a correct pronunciation of Burmese, that he should study the behaviour of tones in different positions in the sense group'.

Essentially then there is no conflict between the Reader and 'Half the Battle' on the tones. The latter confines itself to essentials, to the tones which actually give words an entirely different meaning in Burmese, as is sometimes the case in English, as in the words *import* and *import*. The former endeavours to reduce to writing niceties of expression. To any one who has made any progress in mastering the tones the transliterations of the excellent passages at the end of the book must prove of great interest, and he will gain confidence when he recognizes the confirmation by a phonetician of changes in the principal tones that must have puzzled his ear from time to time.

The danger in setting out on paper in such detail the expression and intonation given by a particular person is that a beginner will be misled as to what is essential. Each main tone is subdivided into at least 3 members according to its initial pitch with no indication in the text that the correct toneme is the important thing and the particular member of the toneme a minor matter which will also often as not follow automatically once the correct toneme is given. And the symbols adopted to distinguish tones have their drawbacks. Grant Brown adopts the Burmese အောက်မြစ် (.) and ဝတ်စွန်လုံး (:) for distinguishing the first and third tonemes and leaves the second unmarked as in Burmese. This is easy to follow and to connect with Burmese, but the Reader has already used : for distinguishing long syllables and uses an entirely new set of marks to distinguish the principal tonemes, thus, 7,—, & ʌ which do not stand out at all clearly in the text. Altogether the Reader uses 14 different symbols (including variations in their placing), 6 for the 1st, 4 for the 2nd, 3 for the 3rd and 1 for the 4th toneme. No syllable is unmarked, and even then further shades of pronunciation that ought really to have further marks are hinted at, *vide* the note to toneme I. That is the trouble; when once you begin to commit to paper the intonations of a particular speaker, where are you to stop?

Toneme I of the Reader is subdivided into two classes and each of these again into 3 members according as to whether the falling tone starts at a high, middling or low pitch. The result is that no fewer than 6 symbols are used.

The first class is the 'falling tone accompanied by a sharp check in the breath' of Grant Brown and contains words ending in a pure vowel or in a nasalised vowel and distinguished by the အောက်မြစ် (or its equivalent vowel symbol) in Burmese.

In the second class are included words ending in a final 'killed' Burmese consonant. Word in this class are terminated by an abrupt closure of the glottis, words in the former by a weak closure. But there does not seem to be any necessity to distinguish the former by the symbol ʌ at the end of the word. All pure vowels in the second class with one exception) are distinguished by the use of a separate vowel

symbol, and the differences in sound are described in the notes on the Burmese vowels. Thus we have *i* for *i*, *a* for *a*, and *u* for *u*. We also have in this class the diphthongs *ai*, *ov*, and *av*, none of which appear in class I except when nasalised, when they are clearly distinguished by a distinct symbol. And all syllables in this class are still further distinguished by the final symbol *ʔ* (replacing *ၵ, ၶ, ၷ, ၸ* in Burmese and *k* and *t* in *Half the Battle*'), so that there is no possible room for confusion with words of the first class even if the final symbol were omitted from that class. The mark *ʔ* also distinguishes the variation in the pronunciation of the vowel *ɛ* in *ၵၵ* (*lɛ*) and in *ၵၵʔ* (*leʔ*) which is not considered by the Reader sufficiently important to require a distinct vowel symbol.

Turning to the different pitches of the toneme marked by 7/7/7 an examination of the transliterated text bears out the contention that the use of the subsidiary members of the toneme depends on the nature of the neighbouring tones and on stress. If an Englishman has got the principal member of the toneme correct, he will automatically vary his pitch directly in relation to other words in the sentence; and in some cases at least it is clear from an examination of the transliterations that the use of subsidiary members of the toneme depends not even on the nature of neighbouring tones but on the emphasis and intonation given by the speaker in relation to the general sense of the passage, thus in the translations we find the plural particle *ၵၵ* in the word *ၵၵၵၵ* put into both the second and third members of the first toneme, so also with the particle *ၵ* in *ၵၵၵ* and with the connecting particle *ၵ*, for instance in the expression *ၵၵၵၵၵၵ* it is in the second member, and in *ၵၵၵၵၵၵၵၵ* it is in the third member. As regards the third member of the toneme, that is low and falling, it is occasionally used in the transliterations of a few particles falling in the first class, such as *ၵၵၵၵ ၵၵ*, but with no other class of words and with no words at all falling in the second class, so that its employment appears to be unnecessary.

On the Reader's own showing, the second, third and fourth of the four members into which the second toneme is divided for artistic speaking are not essential. The fourth member will be familiar to anyone who has ever heard the conclusion of a Burmese speech. The third toneme is given three members but, except before the last syllable of the particle *ၵၵ*, introducing a question I do not find it used anywhere in the book and I notice that the first member of the toneme is also given to this particle in one instance. The distinguishing diacritical mark for the fourth toneme appears to be quite unnecessary. Its use is confined to syllables containing the vowel *a*, and syllables containing this vowel are never pronounced in any other way.

To sum up, we find the Burmese Phonetic Reader and *'Half the Batte'* in Burmese in substantial agreement as to the pronunciation of Burmese sounds, and the two combined are authoritative. Except on the question of aspirated consonants there is nothing that can be called a real

difference. That the systems of transliteration followed are widely different is a natural consequence of the difference in the object of the two books. 'Half the Battle' is intended to assist a beginner with no knowledge of phonetics, but with some elementary knowledge of Burmese and with opportunity of hearing it spoken, to identify and acquire the essential sounds and tones of the language; it purposely follows the official system as far as possible and avoids all unessential diacritical marks. The purpose of the Phonetic Reader is, as I understand it, to record for a person familiar with the science of phonetics and with I. P. A. script, but not necessarily familiar with Burmese, the sounds and intonations of the speech of a typical Burman in full detail. Incidentally, it cannot but be a fruitful source of study to the Burmese scholar who has mastered the elements of sound and tones as set out by Grant Brown. To the writer at least it clears up difficulties he has found in apparently different pronunciations of tones which he had imagined ought always to be pronounced with identical pitch. But neither is a substitute for the other and to adopt for elementary teaching purposes a phonetic transliteration as elaborate as that of the Reader would be to abandon all the advantages of the 'Half the Battle' system of transliteration, *i. e.*, its simplicity, and its close adherence to the official system, which in its turn follows the Burmese alphabet as closely as possible.

The official system must be simple enough for the average officer to use, and the resultant transliteration should be such as conveys an adequate idea of the Burmese sound represented to a person with the most elementary knowledge of phonetic representation.

It is a question whether the time has not now come to press for the development of the official system further on the lines adopted by Grant Brown, at least so far as to distinguish essential differences such as those between the aspirated and unaspirated consonants, between the main tones, and between the vowel in the first syllable of the English word "amiss" (*e.g.* အဓိပ္ပာယ်) and the other 'a's found in အာ, အဲ, အို etc.

H. O. REYNOLDS.

GEOGRAPHY OF SOUTH TENASSERIM AND THE MERGUI ARCHIPELAGO.

BY

H. L. CHHIBBER, M.Sc., F.G.S., F.R.G.S.,
Lecturer in Geology and Geography, University College, Rangoon.

CONTENTS.

A	(1) Introduction and Previous Observers	..	..
	(2) Position and Extent	..	..
B.	Physical Geography—		
	(3) Physical Features	..	..
	(4) Drainage	..	..
	(5) Coast-line	..	..
	(6) Geology and Minerals	..	..
C.	Climate—		
	(7) Temperature	..	..
	(8) Winds and Cyclones	..	..
	(9) Rainfall	..	..
	(10) Flora and Fauna	..	..
	(11) Natural Regions	..	..
D.	Economic Geography—		
	(12) Cultivation and Garden Culture	..	..
	(13) Rubber	..	..
	(14) Tin Mining and Tin Smelting	..	..
	(15) Fisheries and Pearl-fishing	..	..
	(16) Shell-carving Industry, Weaving, etc.	..	..
	(17) Exports and Imports	..	..
E.	(18) Population	..	..
	(19) History	..	..
	(20) Communications	..	..
F.	Possibilities of Future Development	..	..
G.	Bibliography	..	..

Introduction and Previous Observers.

The following notes give the observations made during the month of October 1926, when the writer visited some parts of the Mergui Archipelago. Since some of the facts observed appeared interesting it was considered fit to place them on record, the area being one of the comparatively little known but greatly promising districts of the province.

As regards the previous observers a bibliography is appended at the end of this article. Captain Lloyd published in 1838 a "Short notice of the Coast line, Rivers and Islands, adjacent to and forming a portion of the Mergui Archipelago". The earliest notes on the coalfields and tin-stone deposits of this area are by Dr. T. Oldham. Captain Butler's Gazetteer of Mergui district is quite exhaustive for the time when it was written. Warrington Smyth of the Department of Geology and Mines, Bangkok, described his journey to some of the south-western Provinces

of Siam in the *Geographical Journal* in 1895. In 1898 William Sutherland of the Telegraph Department accomplished a march on foot from Mergui to Victoria Point and his observations were recorded in the *Scottish Geographical Magazine*. Rudmose Brown's account of "Mergui Archipelago, its People and Products" is full of interest and he dilates at length on the Salons or sea-Gypsies. The same author in collaboration with J. Simpson has written a report for the Government of Burma on "Pearl Oyster Fisheries of the Mergui Archipelago" and the present author has great pleasure in acknowledging his indebtedness to those pieces of really good work. In 1912 another edition of the Mergui district Gazetteer appeared under the name of G. P. Andrews. There are several interesting articles on the history of this region in the Journal of the Burma Research Society and those by Mr. J. S. Furnivall deserve special mention. References to the portions of the geology of this area occur in the General Reports, 1920-24, by Dr. E. H. Pascoe, Director, Geological Survey of India. Drs. J. Coggin Brown and A. M. Heron have contributed some articles on the geology and minerals of Tavoy district. Lately a pamphlet, "Rubber in Burma", was published by the Government of Burma and the writer with great pleasure tenders his thanks to the Development Commissioner, Government of Burma, for so kindly supplying the figures of acreage under rubber in Mergui district for the last 19 years and also for a copy of the above pamphlet. Acknowledgments have also to be made to the Officiating Director, Meteorological Observatories, Simla for supplying some meteorological data. Sincere thanks are also due to the University College and the University of Rangoon for enabling the work to be undertaken.

Position and Extent.

The Mergui district politically constitutes the southernmost district of Burma. It extends from $13^{\circ} 28'$ in the north to the mouth of the Pakchan river in $9^{\circ} 58'$ N. latitude in the south. It lies between $97^{\circ} 24'$ and $99^{\circ} 37'$ E. longitude. It is bounded on the north by Tavoy district, on the west by the Bay of Bengal and on the east and south by Siam, and at one point in longitude $99^{\circ} 40'$ E., the Gulf of Siam is only ten miles distant.

Physical Features.

The country is a narrow coastal strip between the province of Siam and the sea and is on the whole hilly. Adjoining the sea is a narrow coastal plain with a few villages where cultivation is possible. The hills run roughly in a north-north-west--south-south-east direction. The district is higher in the north than in the south and the highest point, Myengmolekhataung 6,800 in the Tenasserim Division is just outside the border of this district. From that point the country gradually slopes down to the south till about the latitude of 13° N. the contour of 3,000 feet is reached and maintained as far as the east-west bend of the Tenasserim river, where the ground is about 500 feet high. After crossing the Tenasserim river the ascent is sudden but the ground

nowhere rises much above 2,500 feet until Victoria Point, the southernmost limit of the province, is reached.

North of Mergui town, another well-marked feature is the Great Tenasserim Valley, which divides the range into two, the western one culminating in Myengmolekha, as noted above. In the south the most important valleys are those of the Little Tenasserim and the Lenya which have been described in the section on drainage.

Besides the mainland there are numerous islands about 900 in total, forming the Mergui Archipelago. These islands are of very variable size, ranging from King Island with an area of 170 square miles to mere hummocks of rocks projecting abruptly above water. These islands are simply the higher portions of the ridges, projecting above water, and are connected underneath and the whole Archipelago is within the 50 fathom line. These islands appear to lie on 4 tectonic lines. The innermost line marked I on Plate I appears to start from an island, a little south of the mouth of Palauk stream, and runs southwards to terminate with the islands near Karathuri. Secondly, the line of islands which breaks off from the mainland at Tavoy point is very conspicuous. The highest points on this line occur on Tavoy Island, King Island (2515) and Domel Island (2236). Important islands situated on this line are those of Tavoy, King, Sullivans or Lampi and St. Mathews. This line joins the mainland again in the latitude of about 9° N., or a little below the latitude of Middle Island. Another subsidiary line marked II shoots off from King Island and continues through the islands of Sellore, Kisseraing, Malcolm, Forbes, etc. and joins the mainland south of the Campbell Islands. The third line appears to start from the islands near Moulmein and passes through the islands of Moscos in Tavoy district, Elphinstone, Ross, Benticks, Maria, Clara, Lord Lough Boroughs, etc., and ends near the Saya Islands in the extreme south where the sea deepens abruptly to the west. On the outermost line, the islands of Cabusa, Tenasserim, Baileys, Prinseps, Sergeant, Hayes, etc. lie. All these four lines are depicted on Plate I. There are a few islands which appear to be occupying somewhat an intermediate position but in reality they are simply detached portions of the islands, situated on the lines described above. It is apparent that these chains of islands must have formed ridges while the intervening portions now under water may represent the tectonic valleys.

The scenery of these islands is very picturesque. In places beautiful caves have been carved out in limestone, almost approaching marble, belonging to the Moulmein series. Caves, well-known for the birds' nests, which the Chinese regard as a delicacy have been briefly described by Carpenter, (23)* in a small group of 6 marble rocks, on the south east side of Domel Island. But sometimes the caves are also seen in the rocks of the Mergui series. For instance they were observed on the north

These figures represent the number of reference cited in the bibliography at the end.

side of the King Island, at Lin Lun and other places. Generally the coast is steep, except where it is fringed by a mangrove forest, but in places it is a sheer cliff, sometimes the vertical drop being as much as 1250 feet, *e.g.*, the western side of Tavoy Island.

Drainage.

There are three important rivers flowing in a N-S direction, which is determined by the trend of the mountains. The biggest river is the Great Tenasserim which takes its source in Tavoy district. After flowing north for about 50 miles as the crow flies it takes an inverted U-shaped bend and then maintains its southerly course till it is joined by its important tributary, the Little Tenasserim. The united rivers turn eastwards and then north-westwards ultimately discharging their waters by two important estuaries, one north and the other south of the island on which the town of Mergui is situated. All these bends near the mouth have a 'U' shaped form, the base of which is formed by the E-W bend near the confluence of the Great Tenasserim with the Little Tenasserim. This river is navigable for about 200 miles from its mouth. The Little Tenasserim issues from near Mandaung Pass in the mountain range separating Burma from Siam.

The Lenya river, south-west of and nearly parallel to the Little Tenasserim, rises near the frontier, a little below the latitude of Karathuri, an important tin-mining centre, follows the usual northerly course till it turns westwards and discharges its waters in the Bay of Bengal.

The Pakchan river, which rises near the Lenya and discharges its waters through a broad estuary near Victoria Point, runs in a North-West-South-East direction forming the Burma-Siam Boundary.

It must have been noticed above that the rivers in order to reach the sea have to cut through outer ridges of hard rocks and consequently they form narrow rocky gorges with common east-west direction near their mouths.

Besides these there are several coastal streams draining into the sea, the water-shed in the north between the coastal drainage and that of the Great Tenasserim being formed by the range coming down from the north and lying west of the Tenasserim river.

Coast-line.

The coast-line is very irregular and highly broken. It is of the Pacific type in outline, due probably to mountain building movements which occurred towards the close of the Tertiary period. Such movements generally take place close to a margin of a continental mass and they may result in the elevation of mountain ranges beneath the sea. Thus the higher parts of the ranges above sea-level, as noted above, represent

the numerous islands of the Mergui Archipelago. The shore-line is often studded with rockboulders thus making the approach to the islands very difficult and they are only accessible where a sandy beach in a bay exists. The writer often experienced this trouble during his investigation of some of these islands. To examine the rocks we were kindly supplied with a medium-sized country boat by the Deputy Commissioner, Mergui, and had often to touch the coast studded with huge boulders disintegrated by wave-action. Sometimes, on touching the coast, the water would go down so low in a few minutes during ebb tide that the boat was seen resting on boulders and in spite of all our efforts to push it into water, we were compelled to wait until the next high tide. Elsewhere the coast is lined with a belt of mangrove swamps where it is composed of the Mergui series.

The coast-line gives indubitable proofs of the subsidence of land. The present shore-line is very ill-defined, there being frequently more than a mile between high and low tide. According to Morrow Campbell (42), tin workings along the Tenasserim river have exposed a few feet above the present high tide level two layers, several feet apart, of big tree slumps in their natural position buried in silt below the present forest level. All this points to the land having subsided. Above all, such an irregular coast-line could not have been formed except by the subsidence of land and its overflowing by the sea.

Geology and Minerals.

The Geology of the area consists of the following formations.—

VI.—Alluvium.

V.—Tertiaries.

IV.—Granites, Porphyries and Volcanic series.

III.—Moulmein Limestone series.

II.—Patit series (The Sandstone series).

I.—Mergui series.

Mergui Series.—The Mergui series is composed of quartzites, slates, phyllites or altered shales, quartz-grits, conglomerates, argillites and kaolinised sandstones. It is to be noted that quartzites and sandstones are the most predominant rocks of this district, hence the rock-facies is rather of an arenaceous character. These rocks are traversed by quartz veins and pegmatites which sometimes carry cassiterite (tin-ore) but not in sufficient quantities to be of economic value, except in rare cases. Their age is still doubtful; however, they are considered to be of Pre-Devonian age, though they were first correlated with the Chaung Magyi series of the Shan States, believed to be of Archaean age.

Moulmein Limestone series.—The Moulmein series of Permo-Carboniferous age, consist of coarse, crystalline, unfossiliferous limestone, e.g.,

in the Turret Islands, a group whose precipitous limestone cliffs rise sheer from the sea. These limestones, wherever their junction is observed, have been found to overlies unconformably the Mergui Series but in the valley of Ngawun, a tributary of the Little Tenasserim, the Merguis were found conformably underlying the Moulmein Limestones. Mr. Vinayak Rao¹ reports that the former appears to have passed gradually upward into the latter. If this be so and the older rocks truly identified as Merguis, the idea regarding the age of the Mergui series, which has up to the present been thought to be the equivalent of the Chaung Magyi series, may require modification.

Granite.—Granite has intruded very extensively into the sedimentary rocks, mostly the Mergui series and it is known to extend from the Shan States to the extreme limit of the Mergui district, forming the core of the Indo-Malayan mountain ranges. Two types of granite have been recognised, one is a coarse, porphyritic variety and is devoid of tin, the other is a biotite granite which is tin-bearing. The former is the older of the two. The collections of the rocks made by the author are being worked in the Department of Geology, University College, Rangoon, and an account of them will be published shortly². The age of this granite has long remained uncertain. However, Dr. Stamp³ brought forth some evidence tending to prove the mesozoic age of the granite of Tenasserim, a point which has been lately confirmed by the Geological Survey of India⁴. It is now believed by Dr. Coggin Brown that the granite which stretches from Mergui into the hilly, eastern edges of the Yamethin and Kyaukse districts, is identical in composition, age and mineral association and is comparable with the granite of British Malay, Sumatra, Borneo and the Dutch East Indies.

Associated with these rocks occur porphyries in some of the islands. The writer observed several sills of a schistose porphyry on King Island and these porphyries may only represent the hypabyssal phase of the granite so frequently noticed in the islands of this area.

Tertiaries.—Late Tertiary beds of lacustrine and fluviolacustrine origin, consisting of largely coarse conglomerates with some sandstones and clays, cover a greater area in the Tenasserim valley about Tenasserim Town. Fossils have been found in carbonaceous and ferruginous clays presumably of Tertiary age which have been thought to represent the ancestral form of the present day Burmese form *Vivipara bengalensis* race (*doliaris*) (Gould). Sometime the Tertiary strata include shales, (sometimes carbonaceous, sometime with a little oil and gas) lignitic coal in association with resin.

1. Pascoe, E. H., Reeds. G. S. I. Vol. LV, Pt. 1, p. 80.

2. Chhibber, H. L., & Ramamirtham, R., "Petrographical Notes on some of the Rocks of the Mergui Archipelago" (To be published in *Bur. Res. Soc. Journ.*)

3. Stamp, L. Dudley, "Some Evidence tending to prove a Mesozoic age for the Granite of Tenasserim" *Geol. Min. Met. Soc. India* Vol. I, 1926.

4. E. H. Pascoe—General Report for 1922, Reeds. G. S. I. Vol. LV, Pt. I. 1923.

Volcanic and Associated Rocks of the Mergui Archipelago.

The southernmost record of volcanic activity in Burma is to be observed on the Tenasserim coast and on some of the islands of the Mergui Archipelago. This area, not unlike the Malay Archipelago, appears to have been another gigantic centre of igneous activity in Burma where records of all kinds of igneous manifestation—plutonic, hypabyssal and volcanic—are preserved in numbers out of a total of about 900 islands, comprising the Archipelago. In fact the Mergui Archipelago owes its origin to earth-movements, aided very substantially by igneous activity as the islands are generally composed of rocks belonging to Mergui series which have been intruded by granite, different kinds of porphyries or have been overflowed by lavas. Some of the islands are composed of rocks entirely of igneous origin. The volcanoes of Mergui Archipelago continue on to the Malay Peninsula and the Malay Archipelago. Volcanic rocks have been found in Tavoy Island, Iron Island (Thamihla Island), King island, etc.

Starting from the north, Tavoy Island group consists of quartzites, altered tuffs and quartz and felspar porphyry. Felspar porphyries are also exposed in the south of Iron Island with which volcanic tuffs are associated. Along the northern shore of King Island are found numerous sills of porphyritic granite and schistose granite porphyry. West of King Island is situated Maingay Island where, according to Dr. Heron, great development of indubitable volcanic agglomerate is to be seen and is composed of quartz, felspar and biotite fragments with chips of glass and quartzite, evidently the products of paraxysmal eruption of a magma corresponding in composition with granite and rhyolite. Both agglomerate and hypabyssal rocks probably belong to the same period of igneous activity and from these eruptions come the small angular fragments so extensively distributed throughout the Mergui. The fragments of these volcanic and hypabyssal rocks (porphyries) were noticed by the author in the town of Mergui.

The western coast of Elphinstone Island shows a great series of rhyolites and porphyries and the high conical peaks of these islands are composed of volcanic agglomerates including fragments of pumice and devitrified glass, and pieces of various sedimentary rocks. Associated with these are dykes and small bosses of porphyritic microgranite and granites. Effusive rocks extend round the western coast of Elphinstone Islands and the small islets of it, consisting of white tuffs, full of bombs, lapilli, felspar porphyries and cellular rhyolites, almost pumice. The large islands to the east of Elphinstone consist of the same rocks.

Recently a sill of fine-grained olivine-basalt has been found in Medaw Island by Messrs. Sethu Ram Rao and Vinayak Rao. The author has studied this area carefully and a detailed account is communicated in a separate paper.

Minerals.

The two most important minerals that occur in this district are tin and wolfram, the former being worked from time immemorial by the Chinese and the date of commencement of the operations could not be traced. The earliest allusion to the existence of tin in Burma was made in 1599 by the traveller Ralph Fitch, who remarked that on his journey from Pegu to Malacca he passed by "many of the ports of Pegu, as Martavan the Island of Tavi (Tavoy), from whence commeth great store of tinne which serveth all India." Coal, iron-ores and glass sands also occur.

Mode of occurrence of tin and wolfram.—Both tin and wolfram occur in granite which has intruded into the Mergui series, described above. It is on the flanks of these granite outcrops, in strata usually within, probably a thousand feet vertically above the periphery of the granite, that these minerals are found. But tin occurs also as "alluvial tin" at the foot of the hills or in the bed of the stream where it has been deposited by the weathering of tin-bearing rocks. But the out-put of the mineral in the former case is very small and it is these alluvial deposits which have been mainly worked for tin so far.

Out-put.—In 1925, 649 tons of block tin, concentrates and crude tin-ore were produced which were valued at Rs. 10,68,015 while the output of Tavoy district was more than double. (See figures 1 & 2). Of these the major portion is of block tin constituting 590 tons, tin concentrates and crude tin being 56 and 2 tons respectively. The output of wolfram in this district is negligible, it mainly comes from Tavoy. In 1924 only about one-third of a ton was produced, valued at Rs. 90. The mining of wolfram received a great impetus during the war on account of its use in hardening steel for the manufacture of cutting tools moving at a very high speed but after the war there was a serious decline in the output due to the low price of wolfram. The ore now is mainly extracted as a bye-product only, in mines where it occurs in association with tin. There is a revival in mining industry as some of the mines that were closed down after the war on account of little demand for wolfram, have been reopened for tin as the latter fetches a high price these days.

COAL.

Coal, according to Dr. T. Oldham, is known to occur in the district at 5 localities *viz.*, Thatekyang, Heinlat and Kanmapiyin on the Great Tenasserim, Sinchyaung on the Little Tenasserim and at the headwaters of the Lenya River. In the first-named locality the thickness of the coal seam is 6 feet 8 inches but iron pyrites is present in the coal throughout the whole thickness. The association of pyrites and the rapid dip of the beds and the consequent depth all shafts would soon have to be sunk to meet the coal constitute the most serious objections to the working of this mineral.

GEOGRAPHY OF SOUTH TENASSERIM AND THE MERGUI ARCHIPELAGO.

The second locality, Heinlat, is about 6 miles further north of Thatekyaung. The coal is here not less than 17 to 18 feet thick. From top to bottom of this splendid bed there is but little variation in quality; all is of good, glossy aspect and conchoidal fracture, coming out in large and symmetrical masses which, however, crumble on exposure. It burns freely and with a good flame, does not coke, but breaks up and leaves but little ashes. The third locality is only $\frac{3}{4}$ of a mile north of Heinlat and the coal is quite similar to that described above.

The remaining two localities named above are inaccessible as the village of Sinchyaung is 121 miles from Mergui and the Lenya locality is equally distant and the coal seam is only a few inches thick. At present the coalfields which offer a promising and encouraging prospect of coal of fairly average quality procurable at a reasonable cost and in sufficient quantity to be of commercial value are those of Thatekyaung, Heinlat and Kanmapyin.

GLASS SANDS.

Pure white, fine quartz sands exist in unlimited quantity on the coast of some of the islands of the Mergui Archipelago. It is rather surprising that there is nothing on record about them. These sands are generally found in the neighbourhood of quartzites *e.g.*, about two miles north of the southern end of Iron (Thamihla) Island. A sample of sand taken from this locality yielded 97.22 per cent. of silica. Another sample of slightly yellowish sand was collected from the western coast of King Island and on analysis yielded 96.62 per cent of Silica.

Besides the sands, absolutely pure deposits of white quartzite or quartzose sandstone occur in inexhaustible quantity, which after crushing can also be used for glass-making. It may be noted that for a long time to come the supplies of sands themselves would not be exhausted. These quartzites or quartzose sandstones belong to Mergui series.

Limestone of good quality occurs in this area, in fact in the whole of Tenasserim Division; the name of Moulmein Limestone has been given to it.

According to Cyril Fox sand, alkali, limestone or red lead and coal are the raw materials used in most Indian glass works. All the other ingredients except alkali, are available in the neighbourhood of Mergui in Burma. Alkali, as in the case of Indian glass industry, will have to be imported, but Mergui being a seaport has some advantage over the inland towns of India, which have to pay railway freight in addition. It is suggested that the white efflorescent alkali salts, so commonly found associated with the tertiary rocks of Burma, especially in the dry zone, may be tried for that purpose.

On inquiry it was found that a small attempt was made at Mergui to start a glass factory under a Japanese expert but on account of inefficient

management and working it did not prove successful. The writer feels that with inexhaustible supplies of sand, fuel (coal in the Tenasserim valley, which is said by some to be of better quality than Indian coal) and red lead which can be manufactured from the lead of Bawdwin, there is no reason why the glass industry should not flourish at Mergui.

IRON.

Large supplies of iron-ore exist on Kalagyun Island, about 6 miles west of Mergui. The ore mostly appears to be limonite, bog iron-ore. The following is the chemical composition of the specimen hammered from near Masanpa village.

Ferric oxide	..	..	..	71.1
Alumina	..	..	..	2.2
Calcium oxide	..	..	..	1.9
Magnesia	..	..	..	5.2
Silica	..	..	..	9.97
Loss on ignition	..	..	..	9.51
Manganese	..	..	..	Trace
				<hr/>
				99.88

MONAZITE.

The occurrence of monazite, a mineral used in the manufacture of incandescent films has been recorded by Heron¹ from the neighbourhood of Mergui in Shwe Du and Lamewpyin streams. A little galena (*e.g.* Mingay Island) and manganese also occur in some of the islands. The occurrence of limestone has already been mentioned above.

Climate.

The climate of the district is moist and mild, being under the joint influence of the Bay of Bengal and the Gulf of Siam and is unusually healthy for its position. Malaria is practically unknown. The writer often marched for hours together, absolutely drenched in rain, but without feeling the bad effects at all.

Temperature.—The mean monthly maximum temperature at Mergui town is 95° in April, and the mean monthly minimum in December is 61°. The greatest annual range for Mergui town between maximum and minimum temperatures is 34°. The above figures for Victoria Point are 94° for April and 68° for January respectively. The extreme temperatures recorded for Victoria Point are 104° and 64°, while the same for Mergui town (the observations extending over a period of 43 years) are 99° and 43° respectively.

Winds.—The area is characterised by periodic winds, *viz.* South-East, South-West and North-East. The prevailing idea is that the winds

1. Heron, A. M., Monazite in Mergui and Tavoy, *Rec. Geol. Surv. Ind* Vol. XLVIII. pp. 179-180. 1918.

are south-west during the monsoons, but it is very remarkable that in fact the winds blowing for 7 months in a year are south-east for Mergui from March to October except for the month of July, when they are south-west. Most likely these south-east winds are valley winds. Another explanation may be that they blow from the gulf of Siam and through the valleys of the Little Tenasserim and the Great Tenasserim reach Mergui. The range being hardly over 1,000 feet high does not form an effective barrier to the winds. For the remaining four months, November to February, the winds are north-east, but since they are off-shore winds, bring comparatively little rain to Mergui. They may drop some moisture on some of the islands, but in the absence of any statistics nothing can be said with certainty. So most of the rain is brought in by the south-east and south-west winds, the latter being strong only in the month of July.

The winds for Victoria Point are north-east from October to April. In May they blow from south-east and from June to September the place is under the influence of the south-west winds.

It may be noted that during the changes of the monsoon especially in May and October, the weather is stormy with severe squalls; and hurricane winds of the cyclones prevail in the sea at that time of the year. Consequent on the cyclones, originating in October and November, some depressions or storms of moderate intensity have been known to cross the coast of the district and cause rough weather there. However, cyclonic storms are also felt during the south-west monsoons. The force of these cyclones from May to September is felt more in the northern portion of the Archipelago than in the south as their general direction is northwards. This is evidenced by the presence of a large number of blasted trees, said to have been caused by a cyclone. Rubber growing for the same reason is not possible in some of the islands though other conditions are quite favourable for that purpose. Large plantations are generally to be seen in sheltered low ground on the leeward side of these islands. I was told by a European who had his plantation on one of the northern islands near King Island that considerable damage has been done to his trees by a cyclone.

Seas are generally smooth at Victoria Point during the period December to April, slight to moderate in August and September and smooth to slightly rough during the remaining months.

Rainfall.

The normal annual rainfall for Mergui is 162 inches while the extreme values for 43 years from 1878-1920 are 213 and 135 inches. The major portion of the rain falls from May-October, the normal for which is 145 inches. The minimum rain falls during December to February, the total for which is 3.61. The monthly average rainfall for Mergui is depicted on figure 3. The average total of rainy days for

Mergui in a year is 153. The following figures give the normal annual rainfall for six stations in the district where record is kept :—

Victoria Point	..	..	..	158·87
Maliwun	..	..	..	148·73
Bokpayin	..	..	..	157·19
Tenasserim	..	..	..	112·86
Mergui	..	..	..	161·24
Palaw	..	..	..	201·20

From these figures two conclusions can be drawn. First the rainfall decreases as we recede from the coast, and secondly, it increases as we proceed northwards in consequence of the increased force of the monsoons in that direction.

If may be noted that the relative humidity for the district is very high, never falling below 79 and 76 for Mergui and Victoria Point, respectively. The average is 87 for Mergui and 83 for Victoria Point and is above 90 for the former from June-October.

The average figure for clouds¹ is 6·1 for Victoria Point its maximum being 7·7 for July. The sky is clearer during November-April, the minimum figure 3·6 is reached in February. It is remarkable that Mergui has a clearer sky when compared to Victoria Point, the average for which is 4·5. The maximum is 6·8 in July, the minimum is 2·4 in January.

Flora.

The district, on account of moist tropical climate is covered with dense and impenetrable jungle with marvellous undergrowth. The portion under forests is shown in figure and occupies a total area of 5,600 square miles of which 330 square miles are reserved, but attempts are being made to bring additional area under reserve. The vegetation of the area can be broadly classified into 4 types :—

- (1) Mangrove forests,
- (2) Tidal forests,
- (3) Evergreen forests,
- (4) Bamboo forests.

However, as a result of Scott and Robbin's recent aerial survey the forests of this area have been divided into 13 subtypes, *viz.*,—

- (1) Evergreen forests.
- (2) Small Evergreen forests.
- (3) Sub-evergreen forest, consisting of typically small evergreen forest mixed with deciduous forest, seen in the Little Tenasserim Valley.

1. The amount of cloud scale adopted is 0 to 10, 0 indicates a cloudless sky, and 10 is a sky which is completely overcast.

GEOGRAPHY OF SOUTH TENASSERIM AND THE MERGUI ARCHIPELAGO.

- (4) Remnant Evergreen.
- (5) Riverine forests occurring in considerable areas in the valleys of Thinkun and Ngawun streams. The typical species are *pyinma* (*Lagerstroemia Flos Reginae*) and *Thingan* (*Hopea odorata*), *Kanyin* (*Dipterocarp sp.*) and *Lezabyu* (*Lagersiroemia sp.*) are also associated.
- (6) Swamp forest.
- (7) Bamboo with trees. It is associated with *pyinkado* (*Xylia dolabi, ferms*) and other deciduous species chiefly *Zinbyun* (*Dillenia Pentagyna*) *myaukchaw* (*Homalium tomentosum* etc.),
- (8) Bamboo with trees on hills (Hill deciduous)
- (9) Bamboo without trees is purely an artificial type formed as a direct result of shifting cultivation. On those sides where it adjoins untouched evergreen forest its boundaries are absolutely well marked, but otherwise the boundaries are indistinct. The present writer saw a very good specimen of this type on the east side of Medaw Island. The western portion with basalt capped by laterite is under evergreen forest, while the eastern portion made up of Mergui series yielding light sandy soil was entirely overgrown with bamboo and the boundary could be drawn within a few feet.
- (10) Scrub.
- (11) Dry dipterocarp forest.
- (12) Tidal forest.
- (13) Useless growth.

Of these the first five are modifications of Tropical evergreen forest. The first one is by far the most important type and covers more than half of the total area. It has been divided into numerous subtypes, the two most important being "mixed evergreen" and "*Kanyin* forest". The former consists of mixed forest with no species in sufficient quantity to give its name to the type. The second type is characterised by the high proportion of *Kanyin* (*Dipterocarp sp.*) and usually by an understorey of dense bamboo. Generally the *Kanyin* forest is found typically in the broader valleys and rarely reaches as high as the 1000-foot contour, while the mixed is more characteristic of higher slopes. The lofty *Kanyin* tree (*Dipterocarp sp.*) yields an oil largely used in the manufacture of torches. *Thingan* (*Hopea odorata*) is prized a great deal for the making of boats, on account of the elasticity of its wood. Rubber (*Ficus elastica*) is said to grow wild on some of the islands while *Hevea Brazilensis* is flourishing very well, as described in a later section.

Mangrove forests growing on slimy mud flats adjoin the coast and the trees remain under salt water for the greater part of the day and occupy perhaps an area of 1,000 square miles. They are the home of *Rhizophores*. The principal species are (*Rhizophores mucronata*), (*R. Conjugata*) and *Kamabla* (*Sonneratia apetala*). Other species occurring on the wide creek banks which may form a separate type by itself under the name of tidal forests, are *Bruguiera pariflora*, *Carapa Obovata* and *Sonneratia griffiths*. The Dani-palm is not uncommonly to be seen along the coast and on mud-banks in tidal creeks. The leaves of this palm are used for thatching the roofs and walls of houses, and its juice for making toddy and jaggery sugar. The bark of the vast mangrove forests is used in the manufacture of a kind of tannin, which is used locally to colour the fishing nets, etc., and some of it is exported. The author saw the process of boiling the bark of some mangrove trees to extract colour at Okpo in Medaw Island and the villagers were seen dyeing the fishing nets either black or brown.

In connection with the vegetation of Mergui, it may be advantageous to quote the words of Warrington Smyth: "From Tavoy we reached Mergui by the B. I. SS. Camilla. It is one of the prettiest of little sea-side towns, the thatched roof climbing the hill to the Pagoda at the summit and luxuriance of vegetation, which showed plainly that we were now in Malaya, in strong contrast to the more truly Burmese scenery of Tavoy. The flora and fauna of Mergui partake of both, it forms a neutral zone where both flourish, but its Malay character is perhaps the more pronounced and the flowering trees and shrubs, and the mango, mangostine, coconut, pineapple, jack fruit and durian thrive as they only know how in Malaya." The trees like rubber etc., which originally grew in Malaya are gradually spreading northwards.

Fauna.

On account of the dense jungle the district is rich in fauna. On the mainland there are two varieties of monkeys, *Semnopithecus obscurus* and *Macaas cynomolgus* besides the white-handed gibbon. Elephants, tigers, leopards, leopard cat, *Sambhar*, barking deer and wild pig (*sus*) are plentiful. Rhinoceros (single and double-horned), wild cow and bison are also found. The Malay tapir has been seen in Tenasserim.

In the muddy waters of the rivers and in the Archipelago fish of numerous kinds, prawns, and shrimps abound, while in the clear waters of the sea pearl oysters, snails, etc., exist. Sharks are numerous and huge sting rays are abundant. Whales are occasionally seen and hence the name Whale Bay, but the authenticity of these observations is doubted by some. Large turtles (*Chelone Mydas*), whose eggs are collected, are also found in the sea. Crocodiles are common in the estuaries of the rivers and many species of water snakes have been recorded. In a few places round some rocky islands, coral reefs exist, while some individual ones of varying colour, yellow, red and black can also be collected.

Birds are not very abundant, though about 100 species have been recorded. The most conspicuous ones are hornbills, pigeons, herons and swallows.

Natural Regions.

The area is on the whole hilly but small stretches of low ground exist between the mangrove forests on the coast and the foot of the hills. Similar narrow, flat plains adjoin the river valleys. Though the coastal strip in places is not very broad, yet from the human standpoint of view it is the most important and deserves separate treatment. The district can be separated into five sub-regions.

- (1) Fertile Coastal Plain lying between the sea and the foot of the hills. It may also be called the area of coastal drainage. This plain is more marked north of Mergui.
- (2) The Tenasserim valley. This is a sheltered valley situated between the ranges on the east and west. With this may also be included the valley of the Lenya and the Little Tenasserim.
- (3) Hilly Region, over 1,000 feet above sea-level covered with evergreen tropical forests. Only tin mining in places and taungya cultivation are carried on in this area.
- (4) Hilly region, above 3,000 feet. This region is only seen in the north of the district in the neighbourhood of Myengmolekhataung.
- (5) The Mergui Archipelago. This sub-region agrees in many respects with the coastal area but ethnologically it forms quite a distinct region, Salons forming by far the major population. However, products are also maritime.

It has already been remarked that all human activity is at present centred on the low plains. Cultivation, garden-culture, fishing, pearl-fishing, rubber plantation, mining of alluvial tin and the smelting of tin-ore are all carried on in this sub-region. Hence this area is very important from the economic point of view, and we shall take these industries in order.

Cultivation and Garden Culture.

Owing to the existence of more paying pursuits *e. g.* fishing, pearling, growing of rubber, tin mining and tin smelting, cultivation has remained in a very backward state in this district. Hilly nature of the ground, bad communications and no market for surplus produce, are other factors which have adversely affected the progress of agriculture. Only 142,555 acres of land were sown during the year 1926 (See Fig 4). Rice is practically the only crop grown in this district; 84,002 acres of land are devoted to it.

It is noteworthy that the people, on the whole, especially the Chinese, are very keen on garden culture. It is remarkable that the fruit gardens occupy about one-fifth of the land under paddy cultivation. Area under Dani palm is 8,853 acres. Cocoanut plantations cover an area of 2,260 acres of land. There are gardens of betelnuts, duryan and mangosteens.

Rubber.

Rubber, (*Hevea Braziliensis*), a denizen of the equatorial regions, requires a warm moist climate with rainfall as evenly distributed as possible throughout the year. The soil upon which rubber is found to grow well in this district is laterite which is found forming a cap on the loamy soil of the Mergui series.

It is noteworthy that Captain Butler, writing in 1883, makes no mention of rubber in the Gazetteer of this district which in other respects is fairly complete. It was about that time when attempts were being made to introduce rubber in this district. Rubber (*Hevea Braziliensis*) was first introduced by the Government in 1878, and after some years of experimental working the estate was handed over to the Crown Rubber Estate Coy. The cultivation of rubber is becoming very popular and wherever suitable ground can be obtained, it is planted with rubber. The cultivation of rubber is not only spread over the mainland but on the islands as well. Places like Katan, Kapa in King Island, which were the haunt of tiger and other wild animals about 40 years ago, are at present the scene of extensive rubber operations. On the islands the leeward side is more favourable for plantation purposes than the windward side since some of the islands are situated in the cyclonic belt—the tail end of the Andamans. Mergui occupies a premier position in the growing of rubber, and in 1925-26 the area under rubber in this district was 24,894 acres, out of a total of 79,437 acres for the whole of Burma. Fig. 5 compares the acreage under rubber in different districts.

It may be of some interest to outline the development of a rubber plantation in this district. First of all the land is leased from the Government for 30 years. It is cleared and the rubber trees are planted. It is best to plant 60-90 trees on an acre of land. No revenue is to be paid for the first 8 years, after which the royalty is Rs. 3 per acre. The trees begin to yield in their 5th and 6th years. The labour employed is mostly Telegu. The coolies are paid about ten annas a day, working 8 hours a day. Obtaining raw rubber entails the following operations :—

- (1) To collect the latex. In collecting juice one has to be very careful. The glasses in which the juice is collected from the tree are carefully washed. It is always better to

tap early in the morning before the sunrise. The hot sun and breeze cause the coagulation of the rubber juice;

- (2) to dilute the latex to proper strength;
- (3) acetic acid is added to coagulate it ;
- (4) the collected juice is measured out in pans ;
- (5) after 8-10 hours or sometimes a day it is ready for rolling. First plane rolling is done. Then the rubber sheets are pressed in marking machine ;
- (6) lastly the sheets are smoked for a few days and the temperature should not exceed 120° F. Finally the rubber sheets are packed and are shipped abroad.

Crêpe Rubber.—Some of the juice congeals on the tree and this is converted into crêpe rubber. This is first washed thoroughly by a machine called scrap washer, whereby the bark is removed with continuous showers of water. After washing it is placed in a crêper and finally it is pressed in a sheeting mill. The rubber thread or the "bark shaving" is also exported as it can be converted into rubber solution easily and yields pure rubber.

Season of tapping.—The rubber in Mergui district is tapped for 8-9 months in a year, and rest is given to the trees during the rainy season, say from July to September. This has a very beneficial effect and restores energy and vigour to the trees and keeps them immune from disease. During November-December the yield is maximum; while during January and February the yield is minimum on account of wintering. In one month only one inch of the bark and half round the tree should be tapped at a time. The average annual yield per acre is at least 200-250 lbs., but in some well managed European estates the average yield is 350-400 lbs. per annum, while in certain cases it is as much as 500 lbs. The cost of production is 7-8 annas in the native concerns, but it is 9-10 annas in the European factories.

Price of land of one acre under rubber.—The price depends upon the locality, general condition and health of trees. It would not be possible to buy an acre of land under rubber for less than Rs. 300 but in the neighbourhood of Mergui it would not cost less than Rs. 1,000.

Life of the trees.—To my inquiries with regard to the average life of the trees I was told that even some of the oldest trees in the area are giving a steady yield if not on the increase. Lately I have come across a pamphlet on "Rubber in Burma" issued by the Government of Burma where it is stated: "Some of the Dutch research workers in Java came to the conclusion that thirty years was the normal life of a rubber tree while the Manager of the Mergui Crown Rubber Estate was able to demonstrate that the latex yield from trees as much as forty years old was

better than from any other areas on the Estate". The writer's queries also support this conclusion and the average life of a rubber tree must be much above fifty years in this area.

Comparison of the conditions of rubber growing in Mergui with those of the F. M. S.—As already remarked no royalty is levied for the first 8 years and no premium is charged for the lease of land in the area under description. The cost of production is considerably less, secondly there is an almost entire absence of disease amongst trees in Burma, and thirdly, the yield per acre on a well managed state is actually higher in Mergui than in the Federated Malay States.

In conclusion, as remarked later on, there is a great future before this industry. This will be evident from the fact that the land under rubber has considerably increased in the last 20 years which is shown graphically in figure 6. During the year 1908-09 the acreage under rubber was only 3,642, while in 1926-27 it was 27,983, and a considerable area of land quite fit for rubber growing is still available. The only possible fear is the invention and manufacture of cheaper synthetic rubber to replace this cultivated stuff, as was the case with indigo, the cultivation of which was once carried on on a large scale in the province of Behar in India.

Mines and Methods of Mining.

Tin mines occur very widely spread in the district. Starting from the north there are mines at Palauk. Next we come to those of Palaw, Shan and Palauk Pha Chaung. Further south are the mines situated near those Zedawun, Tenasserim, Thabawleik, Yemauk, Tagu, Thindaing, Zawi, Wunna, etc. Finally in the extreme south the tin mines of Bokpayin, Karathuri, Lampi, Lenya, Maliwun deserve mention. Of these the last are the richest. It must be stated that by far the larger number of mines is situated in alluvium.

Wolfram Mines of the Mergui District.—The chief wolfram deposits of the Mergui district are near Palauk in the north, and at Tagu near the Great Tenasserim River, and about 70 miles from its mouth. The Palauk mines lie partly in granite and partly in Mergui sediments, but the producing veins are chiefly in the latter. The veins of the Tagu area are remarkable for their large size varying from 3 to 15 feet in thickness. They are all in granite and carry arsenopyrite and chalcopyrite. The veins of the Maliwun mine in the extreme south of Mergui district are in granite, very close to its contact with sedimentary rocks. Other minerals in addition to wolfram and cassiterite are mica, pyrite, chalcopyrite and arsenopyrite, but wolfram is not worked now-a-days, excepting only as a bye-product of tin. It may be interesting to note that wolfram mines which were closed down after the Great War on account of little demand for this mineral have been recently re-opened for tin.

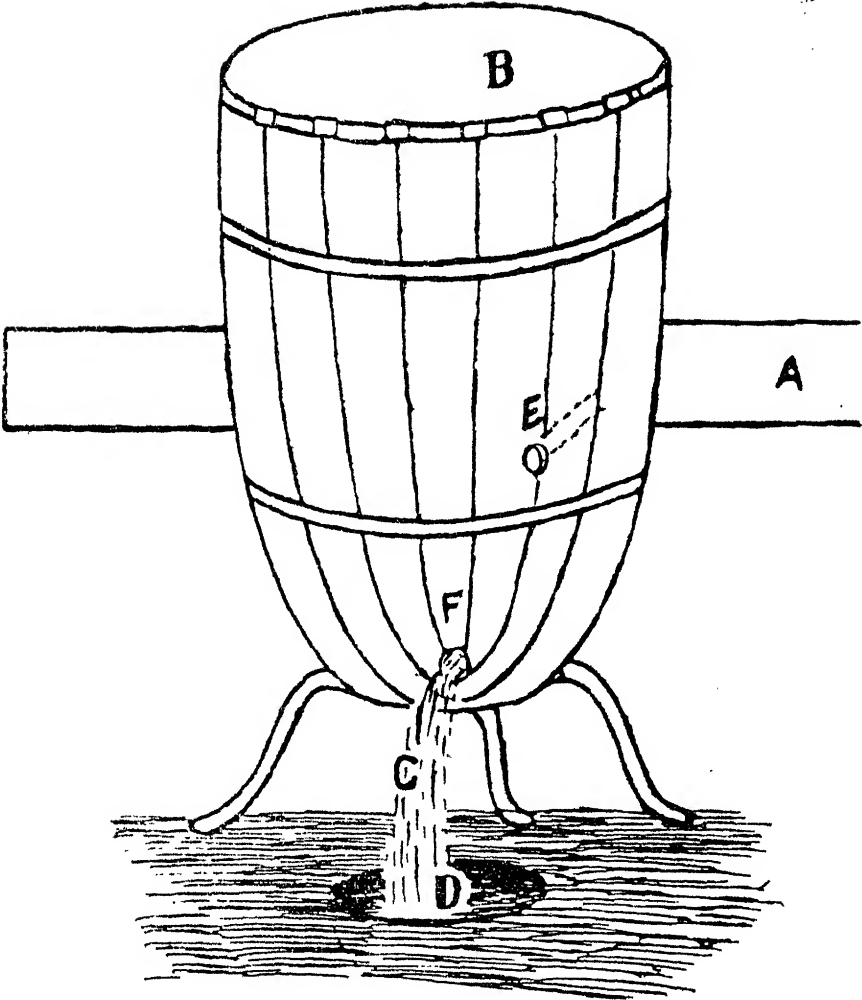


Fig. 7.

H. L. G.

Fig. 9.

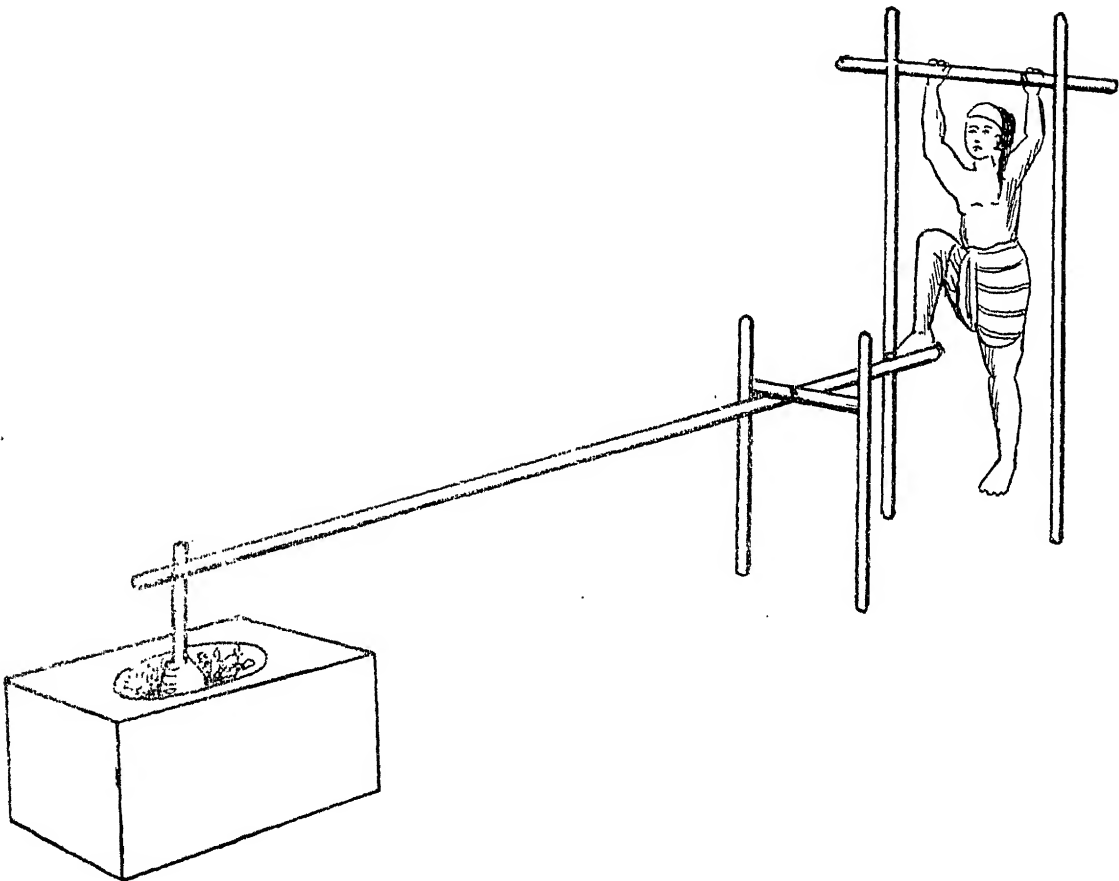
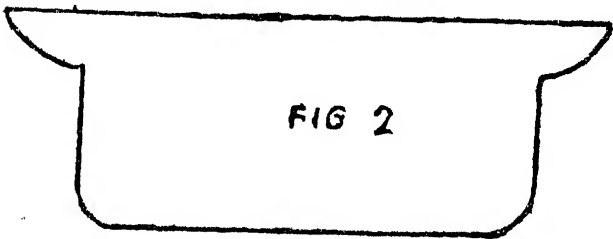
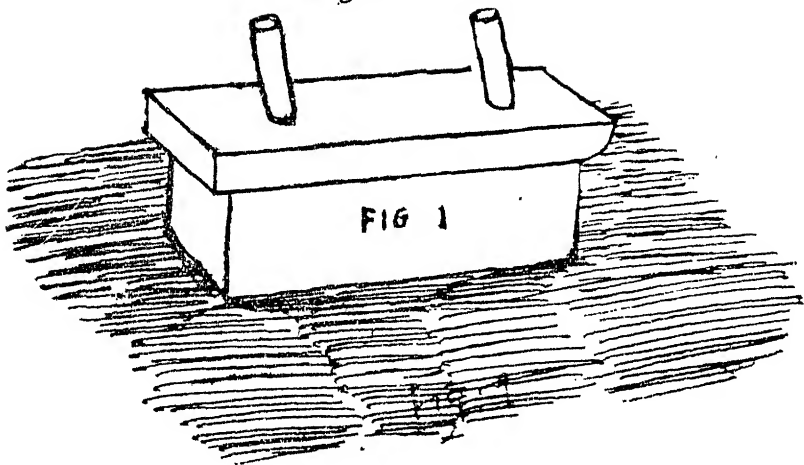


Fig. 8.

In tin mining it must be observed that the greater quantity of the ore is won by native methods, which consist in cutting or blasting a hill side and then washing the detritus with rain or with water races; or sometimes the upper layer of useless detritus is removed and the lower layer of ore worked similarly. Another method is by tunnelling and sluicing. Dredging of tin is also started at Thabawleik and Theindaung. Small quantities of tin are also obtained by washing or panning in the bed of the stream. This method was more popular in the past when Siamese women were said to have earned a dollar a day. All the above methods are employed in working alluvial tin, but when found associated with granite, mining has to be done with explosives and extensive machinery. Annually over 2,000 men are employed in these mining operations.

Smelting of Tin-Ore.

Tin-ore, after it has been properly washed and freed from earthy impurities, is smelted in a small furnace (see figure 7) designed by Chinamen and this furnace has been in use from every ancient times. The furnace is barrel-shaped, made of mud to which some common salt has been added. It is fastened by both vertical and horizontal iron bands about one inch wide and stands on three legs about 2 feet from the ground. There are two openings at the bottom, one in front and the other at the back. The latter is meant to receive air coming from the bellows shown in the above figure.

The ore after washing and dressing is pounded in a crusher of native design shown in figure 8. It consists of a stone mortar where ore is placed, and the crushing is done by an iron hammer which is worked by manual labour on the principle of lever. A furnace is filled with charcoal which is lighted, and then tin-ore is subsequently added which melts and flows down through the hole in front of the bottom and the molten metal is allowed to accumulate in the pit dug in earth just below the hole in the furnace mentioned above. Slag being lighter floats on the metal and is removed by a ladle.

Close by there is another pit dug in earth in which a mould of a block is prepared by pressing a wooden block, the shape of which is depicted in figure 9(1). The molten metal is poured in the mould thus made where a block of tin congeals and has the shape shown in sketch figure 9(2). The weight of a block of tin varies from 30 to 50 viss. (A viss is approximately equal to $3\frac{1}{2}$ lbs.) It takes about three hours to smelt tin-ore to get a block. It is noteworthy that the slag is re-melted three or four times to make a thorough extraction of metal, and again after about a year or so the slag is re-melted to obtain any tin that may have escaped. Five to eight blocks of tin can be obtained in a day by six people working in batches of three. One man works at the bellows, two at the furnace.

On enquiring the author was told that about 40 viss of charcoal are required to produce one block of tin and the ore is smelted without any flux. It is said that Chinamen brought this method from Penang. It must be noted that though this method is being used even at the present day, it is in reality an old method devised by the ancient Chinese who worked in Penang and elsewhere. In the town of Mergui and elsewhere the author saw the extensive presence of old tin slags, indicating that the smelting industries in the past must have been carried on on a fairly large scale. However, the date of commencement of smelting tin in Mergui could not be ascertained, and the present generation have no memory of it.

Charcoal Industry.—In this connection it may be useful to give a brief account of the charcoal industry as fuel is an important factor in every smelting works. The furnaces designed for making charcoal are dome-shaped about 10 feet high, having about the same breadth. They are made of mud, and in the centre is an almost crescent-shaped chamber in which the wood is burnt to form charcoal. For two furnaces there is a common fireplace which supplies heat on both sides through openings provided for that purpose. The logs of wood measuring about 8 feet are arranged inside the chamber and the doorway is closed with bricks cemented by mud, but a hole is provided through which the smoke comes out. There are five similar smoke holes at the top. Heating has to be continued over a number of days, and a furnace is ready for tapping charcoal in about forty days. Each furnace yields about eighty bags, each of which contains about twenty viss of charcoal. Charcoal is sold at eight annas a bag. The wood used is known as Kalawso obtained free of any charge from the mangrove forests adjoining the sea-coast. The writer observed these furnaces at Masanpa situated at the south end of Kalagyun Island. The charcoal is used for tin-smelting and domestic purposes.

Fisheries.

Fishing is one of the most important industries in the district. As mentioned before, numerous kinds of fish, shrimps and prawns abound in the Archipelago. After the rains starts the fishing season (October-May), when almost the whole of the coastal population is engaged in this paying pursuit. In fact every village on the coast or even on the tidal creeks is a fishing centre during that period. It may be mentioned that several temporary camps of Chinamen, Burmans, etc., arise on the favourable spots in the islands of the Archipelago during the fishing season and the camp is broken with the advent of the rains. A large part of the catch is consumed locally, but the surplus in the form of (a) dried, salted fish, (b) Ngapi, (c) dried prawns is exported to Upper districts of Lower Burma, especially, Rangoon and Moulmein.

The fishermen set out in the morning in their frail-looking boats and return with the boat almost full in the evening or the next morning

depending on the favourable tide. As soon as the boat returns to the village, the fish are cut open and cleaned and the head and tail are cut off. After salting properly they are spread for drying on the raised platform in front of their houses, built for this purpose.

The manufacture of Ngapi, for which Mergui is famous, is carried on on a very large scale. Ngapi is a condiment in universal use in every Burmese house. It is manufactured of small fish, shrimps and prawns, which are salted and then pounded and left in water for some time for fermentation. Mergui Ngapi is unique and is relished more on account of its being entirely manufactured from shrimps.

As mentioned above, the third kind of fish manufacture is that of dried prawns. The prawns are netted, dried in the sun for a few days and then are pounded to husk shell. The writer saw small pounding machines used by the Chinese on the west Coast of King Island. The husk is exported to the Malaya, etc., where it is in great demand as a manure.

There are various methods of catching fish and the several kinds of nets used for that purpose have been described by Captain Butler (15).

Pearl Fishing.

Pearl fishing is another important industry in the Archipelago. The present pearl fisheries may be said to lie between French Bay in King Island $12^{\circ}40'$ N and $10^{\circ}0'$ N but it has been said by Dr. Rudmose Brown and Mr. Simpson (27) that there is no reason why pearl banks should not occur at the outer and more southerly islands.

The Mergui pearl fisheries have in the past proved more remunerative for individuals than they are to-day, but still they bring a large measure of prosperity to Mergui and no small profit to the owners. Taking all aspects of the industry it is opined that the pearl fisheries constitute a valuable asset not only to Mergui but to Lower Burma.

The date of commencement of pearl fishing was 1891 when the attention of the Government was drawn to these banks by a Queensland pearler, Mr. Chill. Previous to this no systematic pearling was done in the Archipelago. The Selungs or Salons (sea-gypsies), a nomadic tribe who inhabit the islands, used to dive for shell in shallow water and bartered it with the Chinese traders. Besides mother-of-pearl and other oyster shells, green snail, trocas and beche-de-mer are found.

Both naked diving and diving with apparatus is carried on but the former is only practised by the sea-gypsies (Salons) and is declining on account of the shallow banks getting depleted. In the later case they descend to a depth of 28-30 fathoms. The most important fishing stations are the islands of Tavoy, King, Elphinstone, Ross, Hummock, Warden, Clyde, Observation, Pickwick, Bushby, Hill-peaked, Domel and Ravenshaw Group.

Working Season.—The fishing can only be accomplished during October-April as the strong south-west monsoons necessitate a complete cessation of work. Diving is carried on only during neap-tides so that the working-days of each month vary from ten to fifteen. A total working year is of about 70 days.

The Mergui pearls are noted for their colour and lustre and fetch high prices in the London and other markets. Their average size is greater than that of other species of pearl-bearing oysters; many attain great size with exceptional brilliance.

Pearls range in value from a few rupees to Rs. 15,000 or more, though pearls worth over Rs. 5,000 are rare. The most valuable pearls on record were two found during 1907 in a "Blister" which were worth Rs. 50,000. Each of these pearls weighed 30 rattees.

Shell Carving Industry.

The mother-of-pearl shells after having been tried for pearls are shipped to England but a small quantity is used locally. The shells are cleaned and then beautiful designs are carved and small trays, dishes, knives, forks, spoons, buttons, necklaces and other articles of decoration are manufactured. The finished articles show considerable skill on the part of the makers as they can make fine flower pots or ash-trays out of the shells of snails, etc. (see fig. 1 Plate). Unfortunately the industry is very limited, the writer could see only two manufacturers at the time of his visit in the whole town of Mergui, and it mostly depends upon the visitors who may buy some of these articles as curios.

Another small industry, not unlike the shell-carving industry, is tortoise shell carving industry. Salons collect the tortoise shells, and sell them in Mergui according to weight. The price depends upon thickness and mottling of the shell and varies from Rs. 3 to Rs. 200 a set. Some quantity is used locally in the manufacture of various small useful articles as combs, buttons, links, hair-pins, (see fig. 2 Plate) etc. but mostly it is exported to China and Europe while some is also brought over to Rangoon, where a similar industry exists. The shells are rarely obtained in large quantities.

Other industries are Silk-weaving and Boat-making and incidental manufacture of Fishing-nets, etc. The first is carried on only in the town of Mergui. The silk-yarn is imported while the weaving is done on the handlooms. Consequently Mergui is renowned for its silk *Longyis* and *Pasos*.

As mentioned above, the only means of communications are either sea or tidal creeks and most of the villages try to have a small boat of their own, made of the elastic wood of *Thingan* (*Hopea odorata*). So in Mergui a boat has the same value as a bullock cart in Upper Burma,

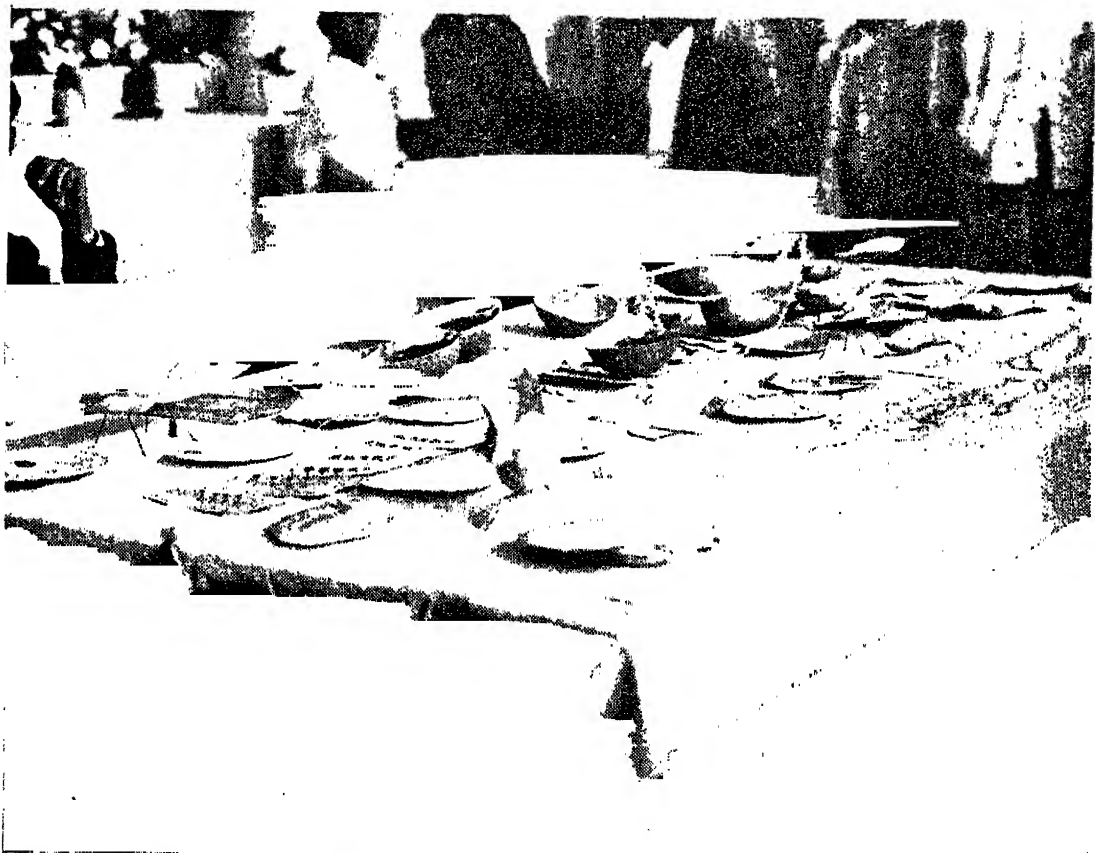


Fig. 1.



H. L. C.

Fig. 2.

Imports and Exports.

It is noteworthy that Mergui, so far as its imports are concerned, ranks easily the first of all the subordinate ports of Burma, but considering the export it comes last of all. As already mentioned, Mergui is not a rice growing district but exports large quantities of tin and rubber.

The value of imports for the year 1923-24 was Rs. 3,61,741 but the exports were valued at Rs. 33,46,892; in other words the value of the latter was ten times that of the former. The imports for 1923-24 include cinematograph films (Rs. 54,000), machinery (Rs. 24,480) provisions and oilman stores (Rs. 26,997), sugar (Rs. 9,782), tea (Rs. 17,915), textiles (Rs. 102,438), vehicles (Rs. 7,559). Besides these all other manufactured articles of merchandise, imported in the same year, cost Rs. 92,189. It will appear from the above that textiles are the most important of all the imports, and then cinematograph films, provisions and oilman's stores, machinery, etc., follow in order.

The most important exports of Mergui are rubber, tin, fish manure, fish, shells, etc. It will appear from what follows that these commodities have been arranged in order of their value. During the year 1923-24, 288,003 lbs. of rubber (Rs. 23,21,333) were shipped. In the same year 257 tons of tin ore (Rs. 4,36,509) were sent abroad. It is remarkable that the value of fish manure exceeds that of all kinds of fish including dry, unsalted fish, dry salted fish, ngapi, etc. The value of the former was Rs. 3,73,407 while the latter was worth only Rs. 64,231. The shells exported weighed 1,398 cwt., which fetched Rs. 54,963. Among the minor exports fruits, dammer torches, and the edible birds' nests may be mentioned.

Population.

In the last census (1921) the total population of Mergui district was 135,465 or roughly 14 souls to a square mile. It is noteworthy that the population of the district has increased $13\frac{1}{2}$ times since its annexation to the British Empire and the gradual increase of population is shown in figure 10.

The population in 1827 as a result of constant warfare between Burma and Siam, had dwindled to about 10,000, roughly 1 man to a square mile. But the peaceful administration of 100 years has brought great prosperity and wealth to the district. Even in the last 50 years the increase has been 288 per cent. The curve is steepest from 1881 and from that year there is an average increase of 20,000 people every ten years. Immigrants come in large number to the Archipelago from October-April which is the pearling season.

Burmans, Karens, Chinese, Malays, Mohammedans of mixed origin, Indians, Salons, etc., comprise the population of this district; the first two, Burmans and Karens, form the majority, but it being situated where three frontiers meet *viz.*, Burma, Siam and Malay, there has been a good deal of mixture of blood of the Burmans with Siamese, Malays with Burmans, Chinese with Burmans, etc. Towards the south there are far more Siamese and Malays than Burmans. Let not the mention of the interesting sea-gypsies, a nomadic tribe known as Salons, be omitted. They inhabit some of the islands of the archipelago, but they seldom settle down permanently but move about in their boats. They, as remarked above, are good naked divers and mostly live on their exploits on the sea. They have been described by several writers; the following account was given by William Sutherland (24):—

“ Outer Bokpayin is one of the very few places where one may occasionally see specimens of that extraordinary race known as the Salons. They are a people peculiar to the Mergui Archipelago and their origin is apparently doubtful. The opinions of various persons who have studied them differ considerably, but the prevailing one is that they are an outcast Malaya tribe who were driven out of the Malay Peninsula and took refuge in these islands. Their language though different from all others, contains a few words with meanings corresponding to similar words in Malay. They have no fixed abodes, but live primarily in boats, moving from place to place as occasion demands. They dive for pearl oysters, search for sea slugs, shell-fish and turtle eggs. Their staple articles of food are fish, jungle pig and occasionally small deer, the former are caught by themselves, and the latter two by their dogs. The women make a peculiar kind of matting which is bartered to passing boats for the few pieces of cloth, they clothe themselves with, and other things which nature does not provide. They are still perfect barbarians and until quite lately would run away and hide at the sight of a stranger. The

pearlers being now at work in the Archipelago in which they live, are gradually growing accustomed to contact with the outside world and a few very occasionally venture to the mainland”.

History

Tenasserim, with its sea-port Mergui, was a very flourishing town for several hundreds of years on account of its being a great market centre since the trade-routes from India and further west and from Siam and China converged upon it as the seas off the Malay Peninsula were infested with sea-pirates; but with the advent of better navigation and greater safety of the sea-routes in the 19th century the prosperity of Tenasserim disappeared.

On account of its occupying a key-position it has been a battle ground throughout between the rival kingdoms of Burma and Siam. Here it may be advantageous to quote the words of Furnivall “During the 17th century Tenasserim became one of the most important markets of the world: the Burmans and the Siamese fought to possess the town; the Portuguese and the French, and in particular, the Dutch and the English fought to control its trade”. The writer is indebted to Mr. G. H. Luce who has contributed the following note on the early history of Tenasserim:—

“The name—written Tanuinsariy, Taluinsare—occurs in several Burmese inscriptions of the 13th century. Tavoy also is mentioned about the same period, under the names Tawai, Daway etc. At Tavoy plaques have been discovered with Mon writing making it quite evident that these parts were held by officials subject to the King of Pagan; unfortunately the king mentioned has a name shared by three of the Pagan kings, and there is no date given. All we can say for certain is that Pagan controlled these parts in the latter half of the 13th century, and very likely earlier still.

“For the early period we must rely mostly on conjecture, based on Greek, Chinese, Persian and Arab texts. From the time of Ptolemy (2nd century A.D.) there were certainly trade-routes passing by sea between China, India and the West. Chinese texts prove that at the beginning of the 3rd century A.D. routes across the narrower points of the Malay Peninsula were in regular use. Among the various place names mentioned, *Tun hsiin* has been identified with Tenasserim; but the theory is quite doubtful and very likely wrong. All we can say is that Tenasserim must have received civilizing influences from India about this time. We read of thousands of “Brahmans” who settled at the Isthmus, carrying on trade and intermarrying with the people. The earliest inscriptions found in the south of the peninsula are in Sanskrit.

"During the 7th century it is quite possible, if not probable, that Dvaravati, the old Mon Kingdom of South Siam, held a part, at least, of Tenasserim.

"During the 9th and 10th centuries there are occasional references in Persian and Arab writers to the Andamans and the coast opposite, and to the flourishing Kingdom of Rahma, which may perhaps be Ramaññadesa, or the Mon Country."

After the 13th century there is a big gap till the 16th century when Siam was repeatedly invaded by the Burmese under Bayin Naung between 1548 and 1569 and in the latter year Ayuthia, the then Capital of Siam was sacked. At that time Tenasserim was under the King of Pegu. In 1587 Bayin Naung's son attempted to follow his father but his army was destroyed. Towards the close of the 16th century the Kingdom of Burma was broken up and Siam was not troubled any more by Burmans until the invasions of Alaungpaya in 1759.

It is interesting to note that in 1683, Richard Burnely and Samuel White were appointed as Governor and Port Officer respectively by the King of Siam. This resulted in the establishment of an English settlement at Mergui but there were the Portuguese, the Dutch and the French also, the last gaining supreme influence at the Siamese Capital. The English who wanted a monopoly of trade did not tolerate it and the friction resulted in a general massacre of Englishmen at Mergui and for sometime the French were in possession of the town; but they were soon expelled.

As noted above, Alaungpaya at the end of 1759 captured Mergui and Tenasserim. In 1776 even the Capital of Siam was captured and a new Capital had to be founded at Bangkok. Since then until their annexation in 1826 by the British as a result of the First Burmese War in 1824, Mergui and Tenasserim remained with Burmans.

It is to be wondered if the happy and prosperous people of Mergui ever remember to-day the strife and struggle through which it passed through numerous years of incessant warfare.

It has been somewhat rightly noted by Furnivall (29) that the development of aviation across the Isthmus might restore prosperity to Tenasserim, but it is to be seen whether it will ever resume its original importance.

Communications.

As regards communications this area is one of the most backward and isolated districts in the whole province. The Communications may be treated under two heads:— (1) External and (2) Internal. The former will be taken first. There is a weekly steamer-service run by the B.I.S.N. Co. between Rangoon and Mergui. The steamer s.s. Sir Harvey

Adamson leaves Rangoon on Thursday morning and reaches Tavoy estuary next morning and the passengers are taken by a small launch to Tavoy. Till afternoon all the loading of tin, dried fish, etc. to be sent to Rangoon is done, and in the evening the steamer leaves for Mergui and reaches there at midnight. It leaves Mergui on Saturday evening, reaching Rangoon on Monday morning. There is another fortnightly service from Moulmein to Penang and the boat touches at Mergui on the way. There is a launch of 100 tons running weekly between Mergui and Victoria Point. Another small launch of about 80 tons plying almost the same way is maintained by a private company. There is a similar launch service between Mergui and Palaw.

The internal communications are few and far between. Roads are practically unknown in the hilly region while the coastal area is covered with mudflats overgrown by mangroves and is interrupted by too numerous tidal creeks. The only metalled road is from Mergui to Kyaukpya, traversing the island on which the town of Mergui is situated and is under construction across the river to Tavoy. There is another small road connecting Victoria Point with Maliwun tin mines.

Bullock carts are practically unknown and their place is taken by boats of varying sizes. Almost every family has a small boat or a dug-out which ply in the creeks for travelling as well as for fishing near the coast. Of course these boats being very light and without any keel are quite unfit for seagoing purposes. The boats that have to go out in the sea for purposes of trade are very big and are much above the means of average people.

The rivers are also navigable for the major part of their course *e.g.* the Great Tenasserim is navigable for about 200 miles from Mergui.

Possibilities of Future Development.

Indeed this district is capable of great future development. Rubber and tin are two commodities which hold out a great promise and a bright future. It has been estimated that there are 100,000 acres of land which might profitably be opened up for rubber. As stated by Major M. T. Porter (41), the areas demarcated on the Index Plans total something like 150,000 acres in Mergui district, and double that amount could be made available. This will give some idea of the latent possibilities awaiting development. The experiments carried out so far indicate that the planting of oil palm and cocoa-nuts will also repay themselves fully. Wherever the former has been tried it has shown magnificent growth and come into bearing after three years whereas the normal period is four years. Adequate scientific prospecting for tin has not yet been done in the district. Many more metalliferous areas are likely to be discovered as a result of careful and systematic investigation.

The opening up of the railway to Mergui and its proposed extension to Perchuab must further a great deal the prospects of these industries. With the advent of the railway, feeder roads will be started which will facilitate communications in this district, which at present are almost none.

Bibliography.

- (1) 1833. Llyod, R., List of the specimens of Rocks from the Tenasserim Archipelago, situated between the Parallels of $10^{\circ} 50'$ and $12^{\circ} 10'$ N., *Journ. A. S. B.* II, 157-158.
- (2) 1838. Helfer, J. W., Note on Minerals found in Tenasserim, *Journ. A. S. B.* VII, 171.
- (3) 1838. Helfer, J. W., Report on the Coal discovered in the Tenasserim Provinces, *Journ. A.S.B.* VII, 701-706.
- (4) 1838. Llyod, R., A Short Notice of Coast-line, Rivers and Islands adjacent, forming a portion of the Mergui Province, from a late Survey, *Journ. A. S. B.* VII, 1027-1038.
- (5) 1839. Helfer, J. W., Report on the Coalfield at Ta-Thay-Ywa on the Tenasserim River in Mergui Province, *Journ. A. S. B.* VII, 385-389.
- (6) 1839. Helfer, J. W., Second Report, The Provinces of Ye, Tavoy and Mergui on the Tenasserim Coast Fol. 76 pp., Calcutta.
- (7) 1839. Macleod, T. E., Note on Hot Springs on the Palauk River, Mergui, *Journ. A. S. B.* VII, 466-467.
- (8) 1840. Helfer, J. W., Fourth Report on the Tenasserim Provinces, considered as a resort for Europeans, *Journ. A. S. B.* IX, 155-189.
- (9) 1840. Macleod, T. E., Notes on the Map attached to the Report of the Coal Committee in the 98th number of the *Journal of the Asiatic Society*, *Journ. A. S. B.* IX, 582-594.
- (9a) 1843. Ure, A., Analysis of Iron Ores from Tavoy and Mergui and of Limestone from Mergui, *Journ. A. S. B.*, XII, 236-239.
- (10) 1848. O'Riley, E., Note on the Geological formations of Amherst Beach, Tenasserim Province. *Cal. Journ. Nat. Hist.* VIII, 186-189.
- (11) 1849. O'Riley, E., Notes on the Geological and Geographical Characteristics of the Tenasserim Provinces., *Journ. Ind. Archipelago* III, 385-401.
- (12) 1849. O'Riley, E., Remarks on the Metalliferous deposits and Mineral Productions of the Tenasserim Provinces. *Journ. Ind. Archipelago*, III, 724-743.
- (13) 1856. Oldham, T., Notes on the Coalfields and Tin Stone Deposits of the Tenasserim Provinces, Government Papers, Burma, 375-406.
- (13a) 1870. Tremenhare, H. S., Note on Tin in Tenasserim, *Min. Journ.* XI, p. 919.
- (14) 1882. Fryar, M., Correspondence regarding Tenasserim Minerals, Burma, 445-449.
- (15) 1884. Butler, J., Gazetteer of the Mergui District, Tenasserim Division, British Burma.

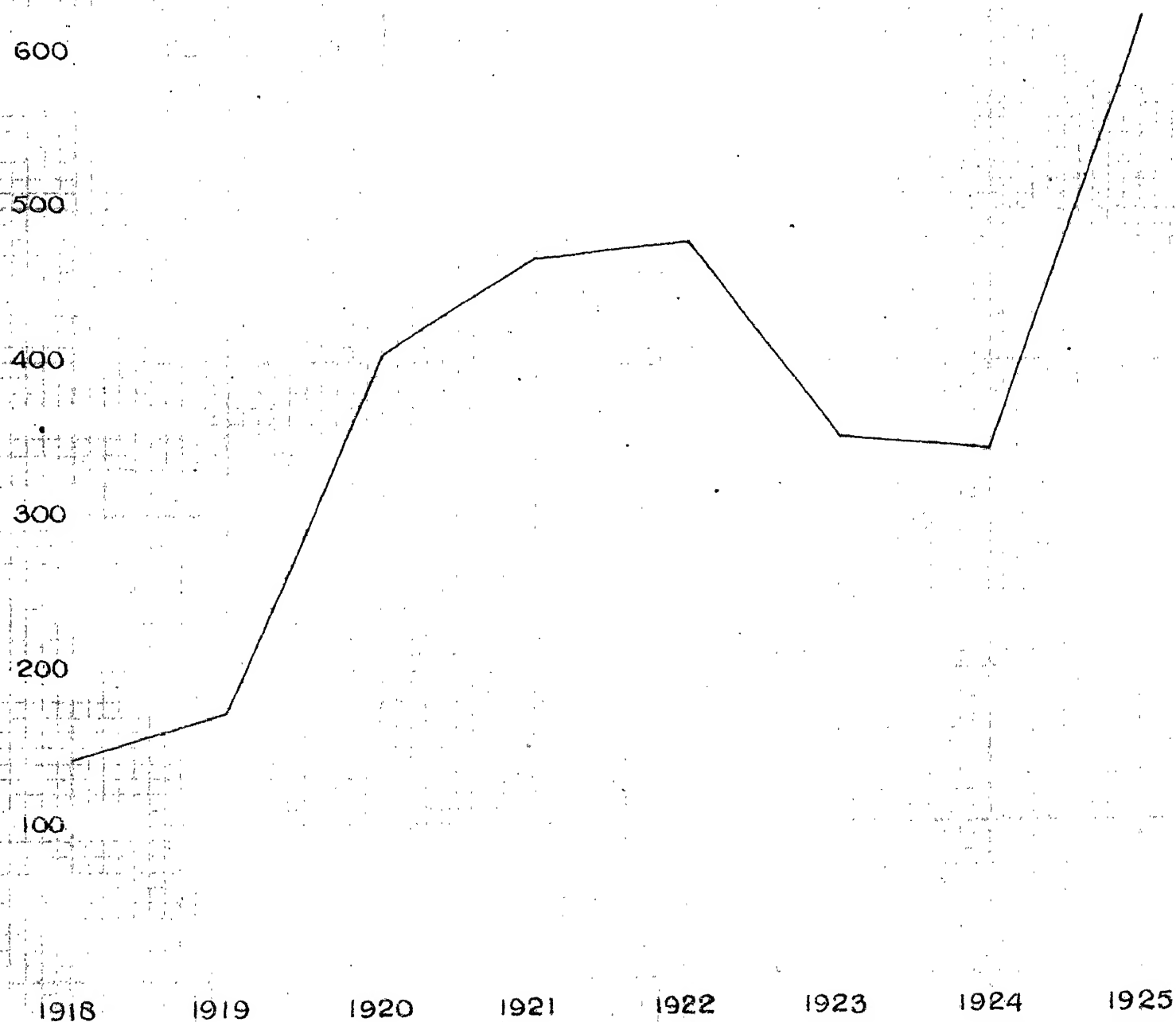
GEOGRAPHY OF SOUTH TENASSERIM AND THE MERGUI ARCHIPELAGO.

- (16) 1890. Anderson, J., English Intercourse with Siam, London.
- (17) 1890. Anderson, J., The Selungs of the Mergui Archipelago London (Trubner & Co).
- (18) 1891. Keith, A., An Account of a Journey across the Malay Peninsula from Koh-Lak to Mergui, *Journ. Str. As. Soc.* XXIV, 31-41.
- (19) 1893. Bose, P. N., Note on Granite in the districts of Tavoy and Mergui. *Rec. G. S. I.* XXVI, 102-103.
- (20) 1893. Bose, P. N., Notes on the Geology of a part of the Tenasserim Valley with special reference to the Tendan-Kamapying Coalfield. *Rec. Gr. S. I.* XXVI, 148-164.
- (21) 1893. Noetling, F., Carboniferous Fossils from Tenasserim. *Rec. G. S. I.* XXVI, 96-100.
- (22) 1895. Smyth, H. Warington, Notes on a Journey to some of the South-Western Provinces of Siam, *Geog. Journ.* VI., 401-421, 522-545.
- (23) 1898. Carpenter, A., The Bird's-Nest or Elephant Islands, Mergui Archipelago, *Rec. G.S.I. Vol. XXI*, 29-30.
- (24) 1898. Sutherland, W., South Tenasserim and the Mergui Archipelago, *Scot. Geog. Mag.* XIV, 449-464.
- (25) 1899. Hughes, T. W. H., Tin Mining in Mergui District, *Rec. G. S. I. Vol. XXII*, 188-208.
- (26) 1907. Brown, R. N., Rudmose, The Mergui Archipelago, Its People and Products. *Scot. Geog. Mag.* XXIII, 463-483.
- (27) 1907. Brown, R. N. Rudmose and Simpson, Jas. J., Pearl Oyster Fisheries of the Mergui Archipelago and Moskos Islands. Government Printing, Burma.
- (28) 1912 Andrew, G. P., Mergui District Gazetteer, Government Printing, Burma.
- (29) 1917. Furnival, J. S., From China to Peru, *Burma. Res. Soc. Journ.* Vol. VII, 27-35.
- (30) 1917. Kyaw Din, History of Tenasserim and Mergui. *Burm. Res. Soc. Journ.* 251-254.
- (31) 1918. Heron, A. M., Monazite in Mergui and Tavoy. *Rec. G.S.I. XLVIII*, 179-180.
- (32) 1919. Brown, J. Coggin and Heron, A. M., The distribution of Ores of Tungsten and Tin in Burma, *Rec. G.S.I. Vol. IV*, 101-121.
- (33) 1921. Bay of Bengal Pilot, Published for the Hydrography Department, Admiralty, by His Majesty's Stationery Officer, London.
- (34) 1921. Pascoe, E. H., General Report for 1920 *Rec. G.S.I. Vol. LII*.
- (35) 1923. Pascoe, E. H., General Report for 1921, *Rec. G.S.I. Vol. LIV*,
- (36) 1924. Pascoe, E. H., General Report for 1922, *Rec. G.S.I. Vol. LV*,
- (37) 1926. Pascoe, E. H., General Report for 1923, *Rec. G.S.I. Vol. LVI*.
- (38) 1926. Pascoe, E. H., General Report for 1924, *Rec. G. S. I. Vol. LVIII*.

- (39) 1926. Mineral Production of Burma for 1925. Government Printing Burma (See others also for previous years)
 - (40) 1925, etc. Season and Crop Report of Burma, Government Printing Burma.
 - (41) 1926. Rubber in Burma, Government of Burma.
 - (42) 1926. Morrow Campbell, J., Tin Mining in Mergui District, Mining Mag.
 - (43) 1926. Scott, C. W., and Robbins, C.R., Report on Aerial Reconnaissance, Stockmapping, and Photography of the Forests of the Tavoy and Mergui Districts, Government Printing and Stationery, Burma.
-

Fig. 1.

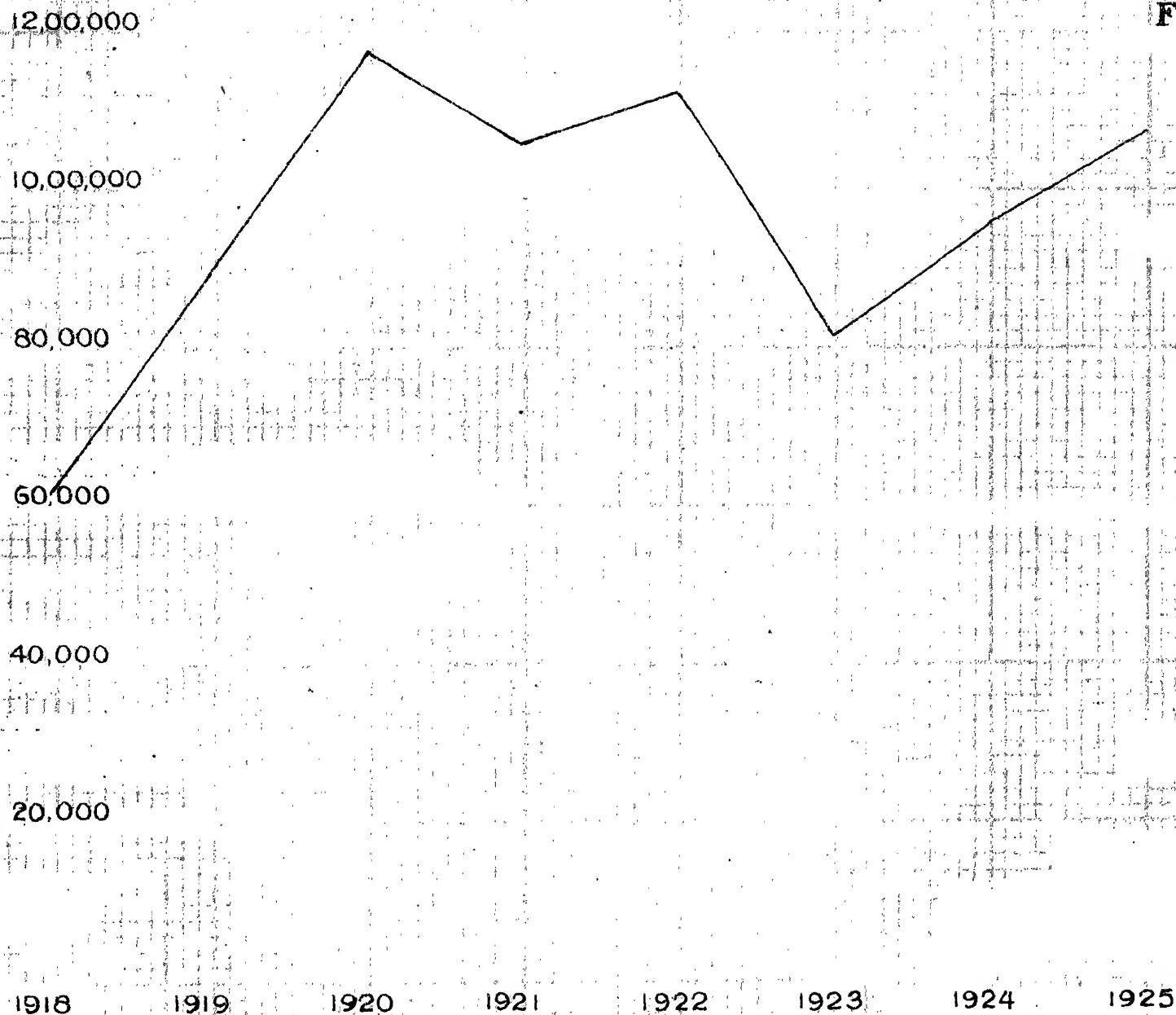
SHOWING THE OUTPUT OF BLOCKTIN IN MERGUI
DISTRICT FROM 1918-25.



3 tons of tin-ore are assumed to be equivalent to 2 tons of block tin.



Fig. 2.



Showing the value of tin in Rupees produced from 1918-25.



Fig. 3.

Rainfall Graph of Mergui

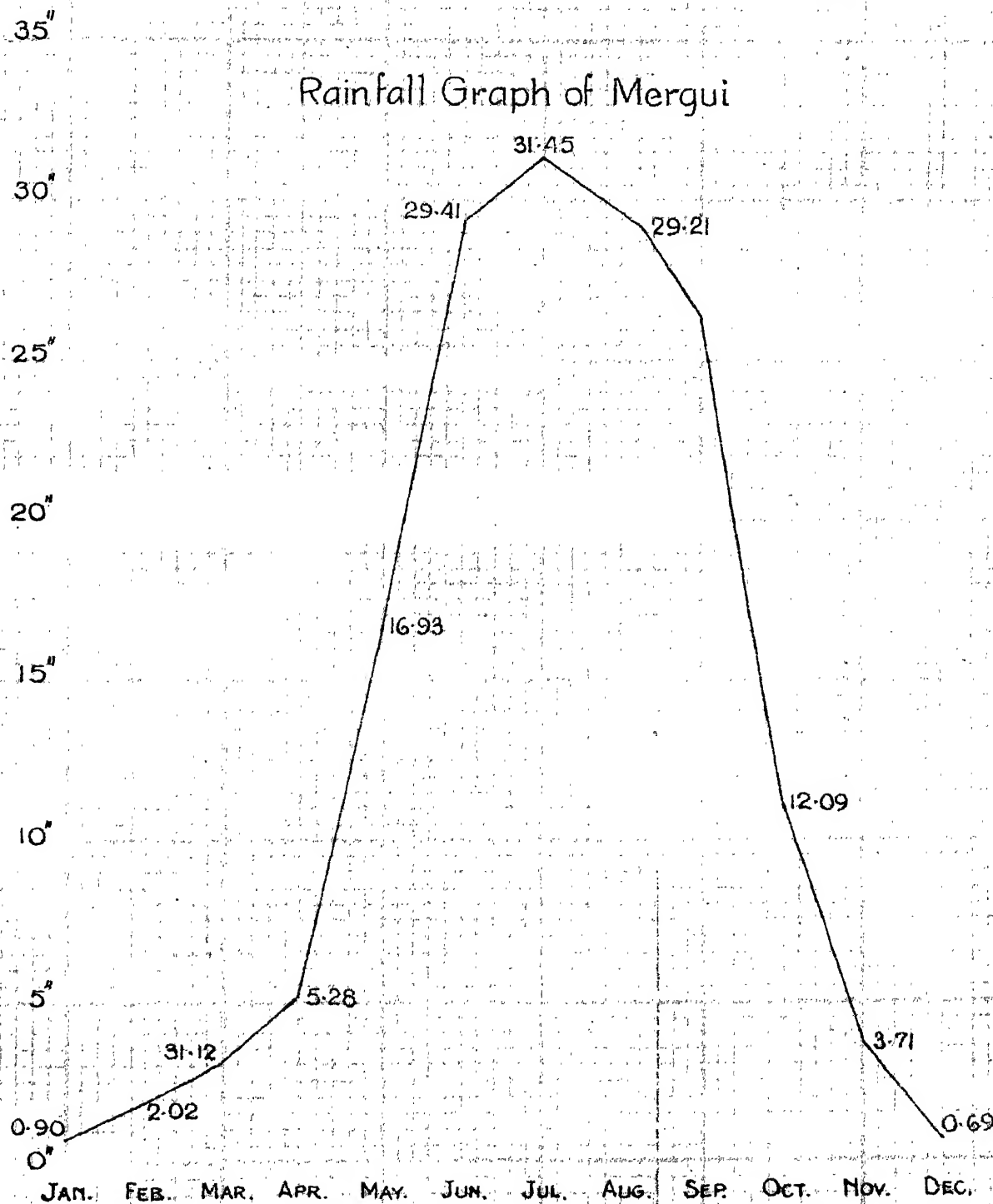


Fig. 4.

FORESTS	NOT AVAILABLE	CULTURABLE WASTE	CULTIVATION
---------	---------------	------------------	-------------

CLASSIFICATION OF AREA OF MERGUI DISTRICT.

Fig. 5.

SHOWING THE ACREAGE UNDER RUBBER CULTIVATION
IN MERGUI AND OTHER DISTRICTS.

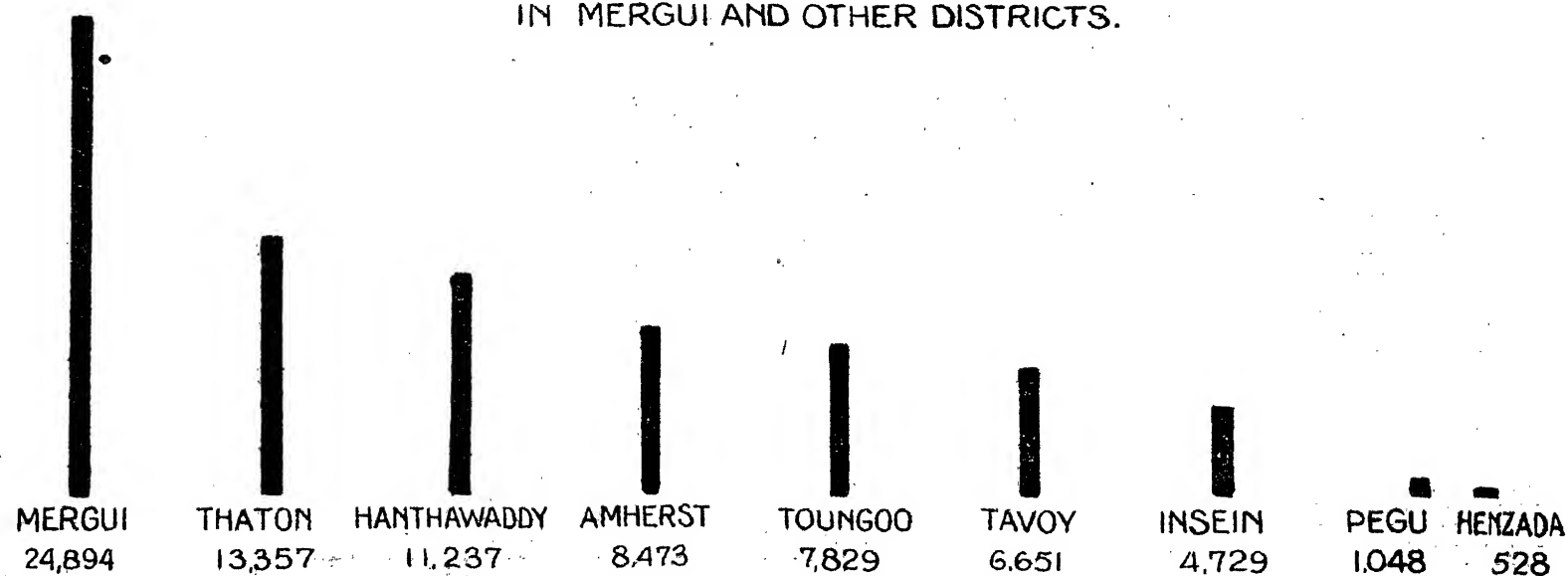
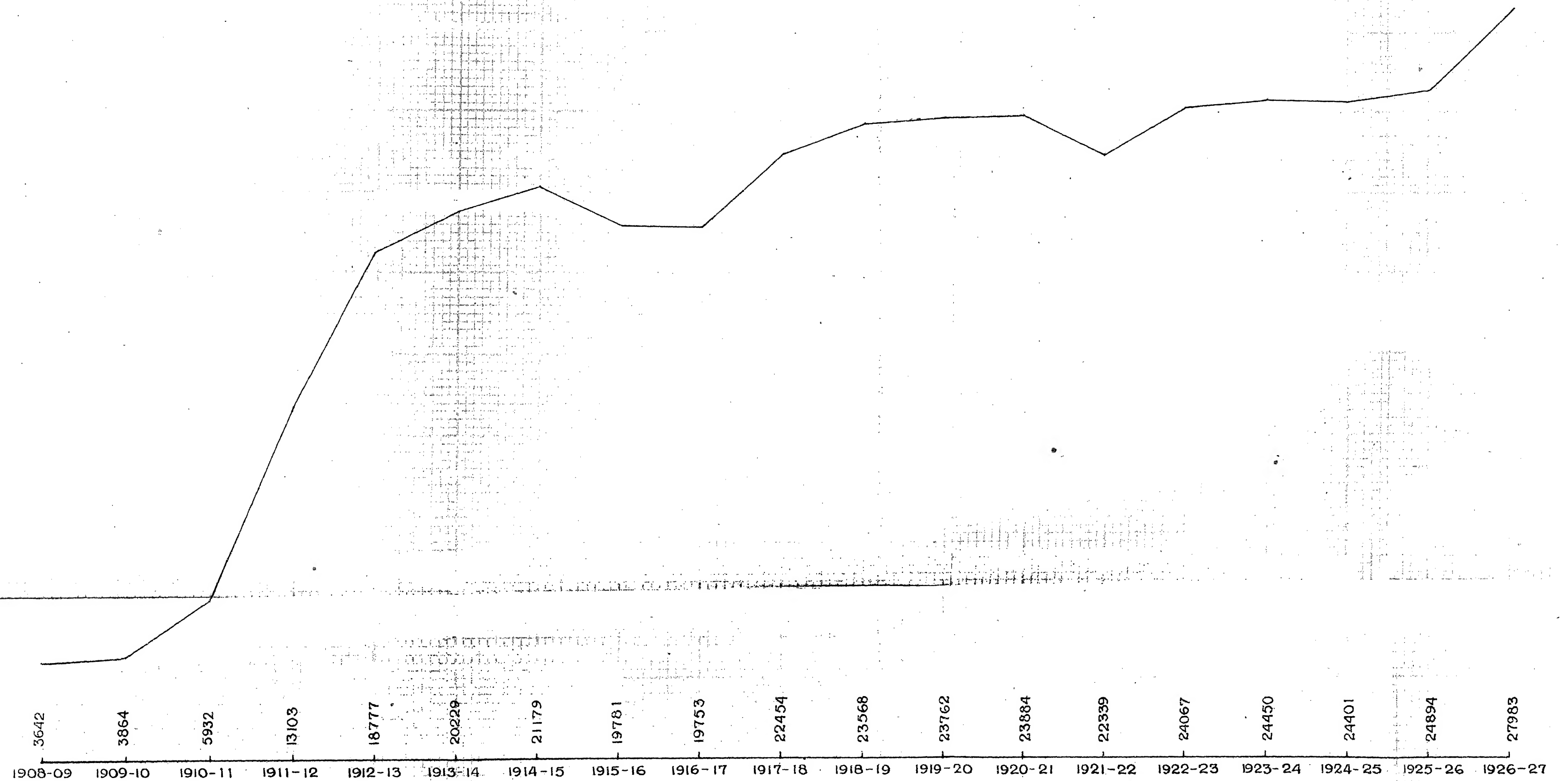
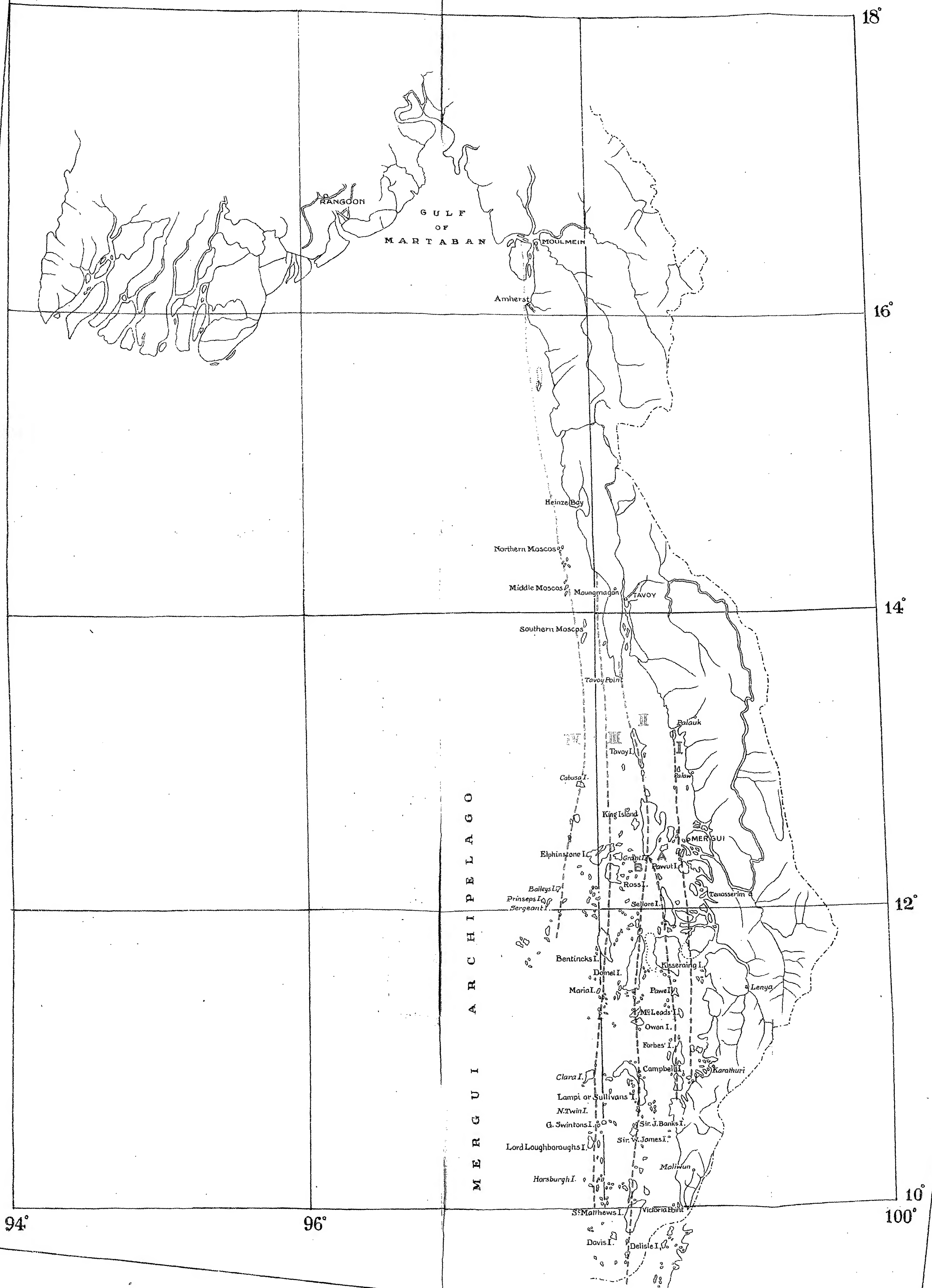
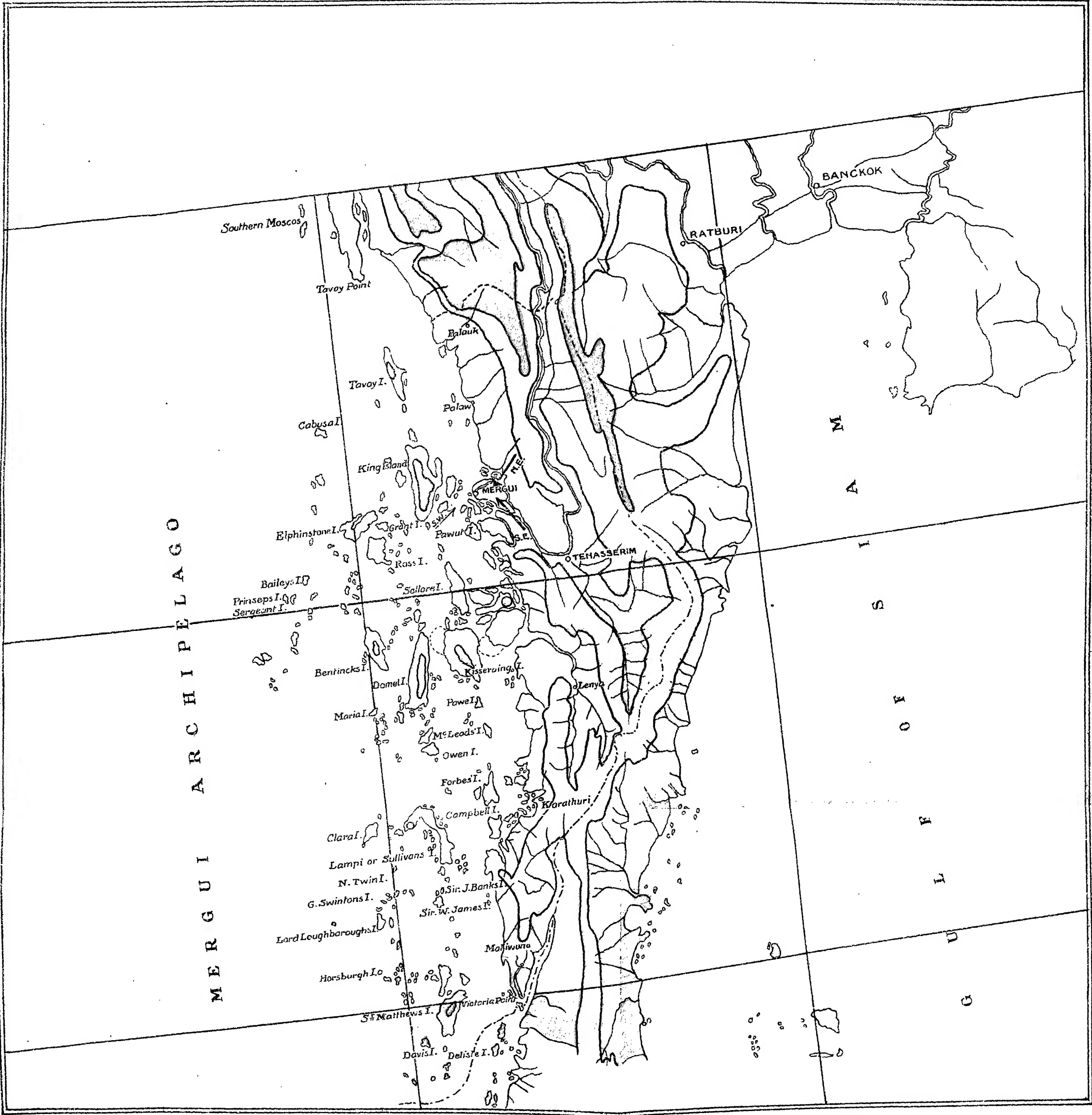


Fig. 6.



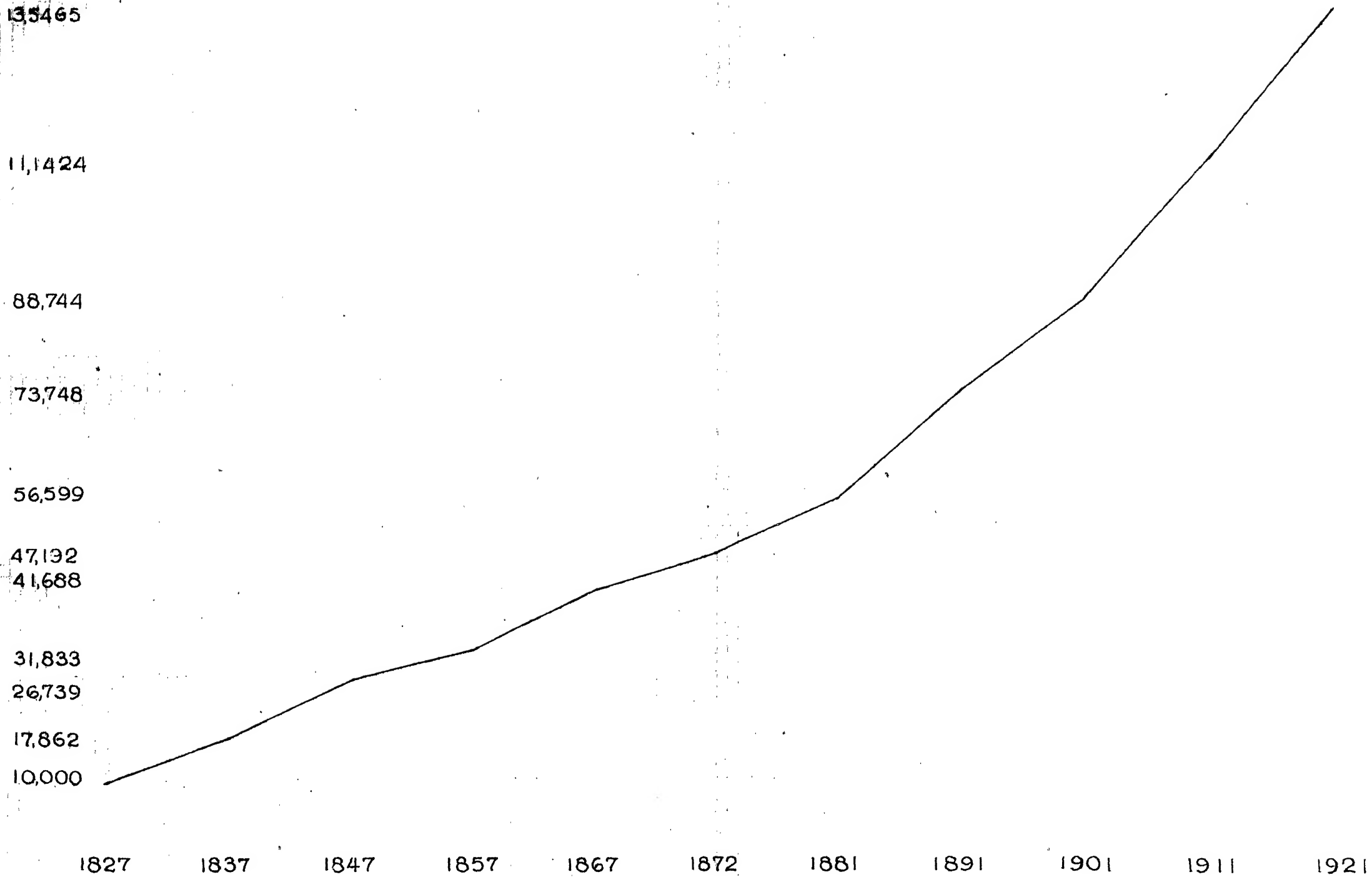
SHOWING ACREAGE UNDER RUBBER PLANTATION IN MERGUI DISTRICT
1908-1927





- Land above 3000 feet.
- Land between 1000-3000 feet.
- Land below 1000 feet.

Fig. 10.



*Graph showing the increase of Population of Mergui District
since its possession by the British.*

A PROSODIC NOTE ON AṬVAGHOṢA'S BUDDHACARITA.

BY

P. G. GOPALAKRISHNA IYER, M.A., LT.

Assistant Lecturer in English, University College, Rangoon.

The Buddhacarita "seems to have been translated into Chinese early in the 5th century.... It was also translated into Tibetan in the 7th or 8th century.... The Tibetan agrees much more closely than the Chinese with the original.... From this point (that is, from shortly after the beginning of the poem) up to the end of the 13th chapter, the Tibetan agrees fairly with the Sanskrit and much of the 14th is the same in all three, but towards the end of the 14th the Sanskrit diverges widely; and Bks. 15, 16 and 17 in the Sanskrit have no direct relation to the corresponding works in the Tibetan or the Chinese" (E.B. Cowell).

Now, the Cambridge MSS of the poem, on which Cowell chiefly relied for his text, has at the end of the book, two *çlōkas* which say that the scribe—presumably the author of the *çlōkas*, having searched in vain for the concluding portions of the poem, himself wrote the 14th, 15th, 16th and 17th cantos, to complete the narrative. The date is also mentioned; it corresponds to A. D. 1830. The other MSS do not contain these lines, but Cowell accepts the statement (and proceeds to identify this writer with one Amritānanda, the official historian and Court poet in Nepal at the date mentioned above.)

The object of this note is to adduce evidence of a strictly internal nature in confirmation of this view. This evidence is metrical, and probably remarkable as such.

The Buddhacarita is a Mahākāvya—the earliest extant, or believed to be extant work of the kind. It agrees with the later and better known Mahākāvyas in its main prosodic features, though without the complex *alankāras*, or the metrical variety and elaborate skill of Kālidāsa, Māgha or Bhāravi whose poems are the best achievements of this carefully cultivated mode of poetry.

The prevailing metres of the Buddhacarita are the *çlōka*, the *Triṣṭubh upajāti*, the *Jagati Vamçastha* and the *Mālabbhāriṇi*, the most familiar form of the *Aupacchandāsika*. To the historian of prosody Aṣvaghōṣa is orthodox and correct to the point of punctiliousness. Within rather narrow limits, his mastery of the major metres leaves little to be desired—narrow limits, because he has not learnt the art of the enjambed and vari-paused *pādas* by which the great classical writers who followed him

made their metres a flowing and in other ways a beautiful medium of expression. The transition prosody of the metrical Upaniṣads must have taken a long time in evolving the classical metres. The rules of thumb had to be established first before the great masters could venture to transcend them. Aṣvaghōṣa represents the stage when the mechanical features of the verse had mostly become fixed.

His stanzas are almost invariably made up of four pādas and not two ardhās as is very often the case with the later writers even in their longer metres. The result is monotony. Another of his important limitations is his overfondness for the caesura after the 5th syllable in the upajāti verse. This caesura varied by the one after the 4th syllable was the pivot of the Vedic and Upaniṣadic Triṣṭubh; but this Triṣṭubh unlike Aṣvaghōṣa's upajāti escaped monotony by its variety of make-up. The great classical writers got rid to a sufficient extent of this caesura; it ceased to be tyrannical in their hands. (This is a statement that will not be accepted by scholars like Hopkins—but a discussion of the point is not relevant here).

One of the metrical conventions of the Mahākāvya writers is that the concluding stanzas of a sarga should be in a different metre from the rest. This is an inheritance from the epics and to some little extent from the Rg-veda. Now Aṣvaghōṣa's practice in this respect is not quite the same as that of his followers. His 'tag-metres' are not mere tags at the end anticipating the matter that follows. Very often the change in metre occurs long before the end, heralding the concluding paragraph rather than a subsequent incident.

The ṣloka of the later cantos of the Buddhacarita differs definitely from the ṣloka of the earlier ones. In spite of its great inferiority as a whole it is very often enjambed and has long compounds, the pāda very often ending at the middle of a compound—a feature that is absent (except in two accidental instances) in the earlier part. This fact along with some difference in the function of the tag-metre and the absence of those pleasing assonances and occasional rhymes of the earlier cantos, have to be counted as contributory evidence; but in themselves they are negligible.

The main and remarkable point of difference lies in the make-up of the ṣloka pāda itself.

The ṣloka holds the place of primacy among Sanskrit metres. With its ancestor the Anuṣṭubh it is the metre of the greater portion of Sanskrit poetry.

It is not a mātracchandās; neither is it a pure Akṣaracchandās—that is, it is not based on the principle of mora measurement nor, except in a limited sense, on that of the fixed syllabic group. It is thus the most

elastic of the Sanskrit metres. The perfected classical *ṣlōka* abhors certain combinations, and prefers certain others. The right test was *grāvyatā*, that is, good rhythm (literally, hearableness).

The ear tuned to the niceties of the *ṣlōka* can readily perceive false or harsh rhythm. But it all depends on one's being able to read the verse properly. The cultivated reader or hearer can easily realise the immense superiority of the *ṣlōka* of the earlier cantos (4, 6 and 12) to that of the later ones (15, 16 and the last portion of 14). All the vices that cause broken, jerky rhythm or ill weighted lines are found in these — vices that are avoided by the better class of versifying school boys (Sanskrit prosody has been bodily taken over by the poets of Malabar; hence it is a living tradition in that part of the country).

But an appeal to the ear is not sufficient for purposes of demonstration. Luckily it is possible to translate the good and bad points of a given piece of *ṣlōka* poetry into statistics, (barring of course the totally intangible but none the less real qualities that proclaim the great master). The process itself is tedious and not quite simple but the results, in cases like the present, justify the labour.

Before proceeding to these figures, certain preliminary explanations are necessary. The *ṣlōka* described below is the perfected *classical* *ṣlōka* which Aṣvaghōṣa uses. It is the final product of a long course of evolution, though the *ṣeḍas*, the *Upvinaṣads* and the epics.

1. The *ṣlōka* is a stanza of four *pādas* (quarters) each consisting of 8 syllables.

2. The *pāda* is theoretically and for certain purposes practically divided into two feet of 4 syllables each.

3. The first and second *pādas* form one hemistich—that is, they form one rhythmical whole: likewise the third and fourth.

4. The first and third *pādas* are similar in structure: so are the second and fourth—the similarity being confined to the second foot in each case.

5. The initial and final of the *pāda* are indifferent in quantity; they may be short or long. (According to Indian metricists, a final short becomes long by virtue of its position. A slight modification of this rule is necessary.) An examination of the practice of the classical writers shows that about 30 to 35 per cent. of the odd lines and from 8 to 15 per cent. of the even lines end in shorts. The short terminal is a part of the enjambling art; hence the greater percentage of shorts at the close of the odd lines.

6. The 5th syllable is as a rule short. The second foot of the odd *pāda* is, as a rule $\underline{u}—\underline{u}$ and of the even $\underline{u}—\underline{u}\underline{u}$. This is the *pathya* or prevailing form of the *ṣlōka*.

Kāmaṃ paramitī jñātva	— — \underline{u} \underline{u} , \underline{u} — —
Devopī ihpurandarah	— — \underline{u} \underline{u} , \underline{u} — \underline{u} —
Gautamasya muneh patnī	— \underline{u} — \underline{u} , \underline{u} — — —
—Mahalyāṃ cakame purā	\underline{u} — — \underline{u} , \underline{u} — \underline{u} —

7. Vipulās are certain syllabic combinations which sometimes take the place of the $\text{u} \text{—} \text{—} \text{u}$ in the odd places. The most frequent of the vipulās are u u u u and — u u u . The last syllable being indifferent, the number of possible vipulās is six (leaving out u — u which is the close of the even pāda). In the Mahābhārata the combination — u — u is fairly frequent. To a much lesser degree u u — u is also present. In the anuṣṭubh of the earlier metrical upaniṣads — — u u also occurs. The names of these vipulās are as follow.

u	u	u	u	na
—	u	u	u	bha
—	—	—	—	ma
—	u	—	—	ra
u	u	—	—	sa
—	—	u	—	ta

German and after them American scholars call the first four, the 1st, 2nd, 3rd and 4th vipulās respectively. In classical *ṣlōka* the 4th vipulā or *ra* is a rarity. And no wonder since it produces a broken rhythm. The *bha*-vipulā or 2nd is much less melodious than the *na* or *ma*. The complete avoidance of the *ra* (—u—u) a very sparing use of it, and a limited use of the *bha* are hall marks of the normal good *ṣlōka* (The other vipulās *sa* and *ta* of course ought not to find a place at all, as they would simply render the rhythm chaotic). The proportion of vipulās in the best poets (we are not here referring to the vipulā $\dot{\text{ṣlōka}}$ of the Indian metricists—which is a ghost) is 10 to 12 per cent—that is 1 in about 10 odd lines will be a vipulā. Any figure markedly above this is a sign of abnormal versification, and in this matter, abnormality is synonymous with badness, unless there are special occasions or justifications as in the case of Māgha whose *ṣlōka* yields a figure as high as 26. His is a special case; his *ṣlōka* has other individual features also. There are probably no other Mahākāvya sargas except the later cantos of the *Buddhacarita*; but we are anticipating. The poet with an ear for continuous versification will not and cannot use a higher proportion of vipulās.

(8) The number of vipulās used is not the only item to be considered. There is an unwritten—and to the poet more or less unconscious—law about the feet that precede the vipulās. This 'law' or metrical necessity arises from considerations of balance or proper weighting of the verse. For instance, it is natural that a *na*-vipulā (u u u u) should be preceded as a rule, by a spondee that is the foot (u u — —), otherwise there will be too many shorts tending to lighten the line over-much. The other vipulās in the best and typical classical verse are naturally preceded, most often or more often than not, by an iambic foot, that is, u u — — . The pyrrhic vipulā precedent is practically eschewed for reasons not far to seek.

A PROSODIC NOTE ON ACVAGHOSA'S BUDDHACARITA.

(9) Again, the metricist's aphorism goes that vipulā verses, as a rule (prāyeṇa) end in a long; and in practice there is a pronounced preference for the long final.

(10) Another important matter is the caesura in vipulā verses. It is a law hard as steel that a ma-vipulā verse (— — — — —) should have the caesura after the 5th syllable of the pāda. We have not met with a single violation of this law, except in these later sargas of the Buddhacarita which afford two instances. In the case of the other vipulās there is a distinct preference for this caesura. (This and similar statements are based upon figures).

(11) The most delicate and elusive but none the less real sign of gifted or correct versification is the proportions of the various syllabic combinations constituting the first feet of the pādas. The best practice (which the metricist has elevated into a rule eschews a tribrach or anapaest after the first syllable in all pādas; in addition it eschews a — — — in the even pādas. The reasons are obvious. By the first law insufficient weighting is avoided; by the second, a succession of three or four iambs, which would completely spoil the clōcka rhythm. Of the other combinations;

Iambic — — — — — (in the odd lines only)
 Pyrrhic — — — — —
 Trochaic — — — — —
 Spondaic — — — — —

the iambic is the least in favour, the spondaic most. The best practice again (leaving out Māgha as a special case) yields 40 to 50 per cent of spondees, less than 30 per cent of trochees, iambs and pyrrhies following with more or less equal figures. In the even lines, the iambs vanish of course, thus raising the figures for pyrrhic and to some extent the trochee. The main thing is the overwhelming majority of spondees and the second place of the trochees. It is not meant that a spondaic first foot is in itself better rhythm than a pyrrhic or trochaic, but that in continuous versification, good rhythm requires the above-said proportions.

This somewhat tedious but necessary preliminary will make the following figures intelligible. Their bearing on the matter in hand will be evident.

Percentages.

I Bks 4, 6, 12.		II Bk 14, (1—68)		III Bks 14, (69—91), 15 and 16	
1052 verses		272 verses		1062 verses	
<i>First Feet.</i>		Iambic.	Pyrrhic.	Trochaic.	Spondaic.
Odd Pādas	I	6	16	28	50
	II	7	17	32	44
	III	27	8	21	44

Even Pādas	I	0	19	31	50
	II	7	18	30	45
	II	15	9	22	52

For purposes of comparison the figures for the Pancatantra (Tantrākhyāyika version) are added. These figures are about normal.

Odd pādas	15	12	28	45
Even pādas	1½	15½	31½	52

From the above table it will be seen that the later sargas have no less than 27 per cent of iambs in the odd feet as against 6 per cent. of the timidly correct earlier ones; but what takes one's breath away is the 15 per cent of iambs in the even pādas—which is a bad mannerism and a prosodic vice. The earlier Sargas have just one iamb (a slip or perhaps textual error). Even Māghas the militant is absolutely free from this iambic horror. The Pancatantra shows 1½ per cent.

Short Finals.

	Odd	Even
I	29	18
II	39	23
III	36	10

The very noticeable item of difference is that of the short finals in even lines. 10 per cent is a very low figure, probably indicating the novice whose natural tendency is to have as few short finals as possible at the end of the hemistiches.

One may also notice that in the later cantos there occur four and six instances respectively of the classical abhorrences uuuu and uuu—in the first place. One has to go back to the earliest upaniṣads or to the earliest portions of the Mahābhārata for examples of these, as well as lines of 9 syllables and 7 of which there are here 9 and 1 respectively.

Now for the vipulās, the other sure test of abnormality.

Number of Vipulās.—

	na	bha	ma	ra	sa	ja	ta	Total
Earlier Books 526 verses. (4, 6, 12)	42	5	6	1	..	..	..	54 (10 %)
Bk. 14 (1—68) 136 v	6	1	..	..	..	..	..	7 (5 %)
Bk. 14 (69—91) 46 v	2	1	1	4	..	..	3	11 (25 %)
Bk. 15 (233)	15	7	12	28	..	1	1	64 (25 %)
Bk. 16 (252)	1	..	3	5	2	..	..	11 (4 %)

That is to say, in the earlier books, the percentage of vipulās is normal—about 10 per cent.; but in the latter part of the 14th book and in the 15th they rise to 25 per cent. and in 16th by some strange freak of repentance perhaps—they drop to an inconsiderable 4 per cent. which is quite as abnormal as the 25. But there is a still more striking difference—whereas seven-ninths of the vipulās in the earlier books are na's and there is just a single ra (out of 54) only a fifth of the later vipulās are na's and there are no less than 37 ra's (out of 86). This is a heavy indictment. These 37 ra's with the freaks (sa, ja and ta) form half the total number! In other words, in all these cases, metrical infelicity of a very vicious kind has been obtained out of vipulās, which in the hand of good poet will yield the most pleasing effects of variation on the (*pathya*) type. This matter of the 4th vipulā is as bad a count as the iambic vice above referred to.

Again in the earlier books, there is not a single vipulā line with a short final—which is orthodoxy carried to extremes; whereas in the latter books there are 27 cases (out of 86) with a short final. This is neither faulty nor abnormal; but it is so different from the earlier books.

Now for the precedent feet. In the earlier books 38 out of the 42 na-vipulās have spondaic precedents the remaining 4 along with the rest (except the one ra) have iambics, whereas in the latter books one-third of the na's have iambic precedents. More than half of the ra's in these follow spondaics.

The last item is the caesura. In the earlier books, three-fourths of the vipulā verses have the caesura after the 5th syllable, and the rest after the fourth. In the later books, less than a third show the former caesura; there are besides 11 non-descript (neither 4 nor 5) instances. In these books also the position of the pause in the ra-vipulā is almost invariably after the 4th syllable (there being only 2 exceptions).

There are other minor details; but it is unnecessary to press them. Metrical differences cannot be greater than those between the *clōṣa* of the earlier books and that of the later. The earlier books show accuracy and orthodoxy rising occasionally to beauty (in the 6th book, for instance); the later, utter ineptitude, chiefly but not solely due to the ra-vipulā in the odd pāda and the iambic vice in the even pāda. It is impossible to believe that the Aṣvaghōṣa who wrote the earlier books wrote these later ones also.

Nothing has been said about the 17th sarga till now. It is in the Daṇḍaka metre—a long succession of the same tri-syllabic combination. The writer probably turned for a relief to the Daṇḍaka, a much easier metre, as far as its mechanism goes. Now, the Daṇḍaka though known to the classical poets (Pingala mentions it and the famous Ćyāmālā Daṇḍaka has been assigned by tradition to Kālidāsa himself), was never used by them in Mahākāvya poetry.

It is not possible to dogmatise where exactly Aṣvaghōṣa's work ends in Sarga XIV. After careful consideration, I am inclined to draw the line at the 69th *śloka*. (Shifting it a little above or below will not affect the results). A fresh paragraph begins there; and the narrative does not gain much from it. The rhythm is noticeably disturbed at this point. It also looks as if the earlier part of this Sarga has also been slightly tampered with.

NOTE.—A suggestion has occurred to me, in explanation of the bad *śloka* of the 15th and 16th Sargas of the *Buddhacarita*. The writer (like some of the Purana poets?) meant to be deliberately archaic and wrote bad *śloka*, thinking he was imitating the *upaniṣads*. I leave it at that.

K'ALA LANGUAGE.

ADDENDUM TO DAVIES' "VOCABULARIES OF MON-KHMER LANGUAGES OF YUNNAN AND WESTERN TIBET".

(*See pocket of cover, "Yunnan, the link between India and the Yangtze"*).

K'ala as spoken by headman of Kokang circle including villages of P'ang-ku Shan, Man-pang and Ta Chai; headman being native of last named.

Note 1. *Romanization*.—Consonants as in English, vowels as in Italian save that :

gh and *kh* as in Hindustani; accents / and ^ over letter 'e' mean that it is pronounced as in French;

'v' is a cross between 'v' and 'w'; obscure vowel is written 'A'.

clipped finals (as in 're-entering tone' words in Cantonese) are put in brackets;

'ss' denotes a sharp sibilant with no appreciable vowel sound;

'aw' gives the same sound as in 'law' save when marked short, the sound is then similar to that of 'o' in 'not';

k, t and p are unaspirated; they would be written by some as g, d, and b. Aspirates are written k', t' and p'.

Note 2. *Accent*.—In words of more than one syllable is always on the final syllable.

Note 3. *Tone*.—The language is strongly tonic. The tones appear to a superficial observer to have a likeness to those of Cantonese; upper even, upper falling, lower falling and at least two "clipped" (or re-entering) tones seem to be the same as in that language.

Note 4. *Indentity and distribution of "K'ala"*.—No information beyond that given by son of Kokang Myoza, who states that there are a number of K'ala villages in Kokang and more in Chinese territory across the eastern border. He says that they are the same as the La; the K'ala describe themselves as "Ss-va", of which the latter syllable suggests a connection with the Wa. The vocabulary collected has more similarity with that of the Wa than with that of the La, as given by Davies. Ta Chai is the one place in Kokang at which the K'alas know their own language; elsewhere they speak Shan or Palaung.

Note 5. *Religion of the K'ala: Buddhism.*—A K'ala temple visited is similar to a third-rate Shan one; the monks wear the yellow robe and use texts which appear to be the same as those used by Shans.

5. ü=ö modified.

Note 6. Final *kh* might be written simply 'h'; initial *kh* is a guttural.

man (human being)	i-püi	bird	sīm
man (male)	pya mē	fish	kā
woman	pya-pun	tiger	a-vai
bride (just married)	kʌ-mun	gold	si
child	kʌ-nyawm	silver	kʌ-mal
father	kōn	copper	lā(t)
mother	ma	iron	yīm
son	kāwn-a-mē	village	yung
head	kyen	road	kya
face	ngai	river	kʌ-awm ze kyawng
nose	mō	hill	kawng
mouth	mawn	field	na
ear	yāw (t)	paddy	ngaw
eye	ss-mangai	husked rice	a-kao
hair	hō (k)-kyen	cooked rice	ō(p)
tooth	ghang	tree	k'ao
tongue	tā(k)	leaf	la
back	ss-kyauug	flower	pui ^{kh} (<i>kh</i> very soft)
stomach	kʌ-tu	fruit	pʌ-li
leg	a-vang	grass	yi (f)
arm	tai	boat	hō
hat	mʌ-law	day	singai
turban	maw	night	pālsawm
coat	ss-pyē	fire	r gaw
trousers	k'lā or k'ālā	water	kʌ-awm
shoe	k'ā-tin	wind	kāl
bag	khāi (<i>khāl</i>)	earth	kʌ-tē
dah	vā(t)	sand	sai
spear	plē or pālē	stone	ss-mao
gun	ss-nā(t)	sky	kʌ-ma
bow	ā(k)	sun	ss-ngai
arrow	tē	moon	lōn
stick	k'ao	star	ezm-un
house	nya	good	maw-mō
door	a-va or ʌ-va	bad	k'yi mawm
thatch	pʌ-lung	big	kʌ-ting
floor	kʌ-mui	small	p'woi
post	wawng	long	lang
		short	pwaw(t)
		tall	lawng

K'ALA LANGUAGE.

plank	p'yen	low	əm (vowel guttural)
horse	pyung		va
buffallo	kya k)	broad	p' wai
cow	kʌ-moi	narrow	mai
pig	li(k)	hot	kāw(t)
goat	pê é	cold	kʌ=chyen
dog	saw (k)	heavy	kʌ-chung
cat	miao	light	na-
chicken	i	many	ət (vowel guttural)
hen's egg	kʌ-tun i	few	
near	té	fall (as from table on to the ground)	pō-to
far	ss-ngai		pyāwk
thick	kʌ-paw	ride	ss-pyāwn
thin	yī	see	nye(t)
wet	chyō	hear	la(t)
dry	kyaw	speak	pu
old (man)	kū (t) (1)	fly	vai
old (thing)	pi-yaw (k)	swim	kʌ-nyai
new	pi-sao	laugh	yam
red	pi-si-kyā(k)	weep	(not recorded)
yellow	lōng	call	yu
black	pi-lawng	sit	chawng
white	pan	stand	ngawm
I	awn	get up	ki-yawng
you	aō	know	lyén
he	(non stet)	read	té-ām
1 té 6 lé		write	yukh (4)
2 gha 7 Xa (2)		make	pyāw(k)
3 wei 8 ss-tai		tie	hu-man
4 pun 9 ss-tim		ask (a question)	paw
5 p'un 10 kao		ask for	kōng
11 kao-té		place	pyi(t)
12 kao-gha		die	takh (4)
etc etc		pound	ch'yen
20 nga		cook	lōū
21 nga té		grind	takh (4)
etc etc		pierce	sāl
30 wei kao		be hurt	k é
33 wei kao wei		a Chinaman	syēm
etc etc		Shan	ss-va
40 pun kao		Kala	(not known, but
etc etc		Wa	Myoza's son
100 ti-pʌ-cha			speaks of the
1000 ti-ying			Wa Hills as
3 men wei puī			"K'ala Shan)
2 horses pyung gha mu (3)			

go	lun	Palaung	PΛ-lawng
come	ign	P' uman	kyaw
ascend	hăw(k) k' lawng	Min-chia	lo-khō
descend	likh chē (4)		
go out	lun		
eat	tsāwm		
drink (water)	nyū (5)		
be lost	tΛ-k' wa(t)		
bring	tui hō (t)		

(1) though the 'u' is not short the sound is pronounced lengthily.

(2) 'a' pronounced guturally.

(3) 'm' is the numerative.

(4) kh aspirated softly,

(5) the u is long but clipped.

H. I. HARDING

EDITORIAL NOTICE

The scientific number of the Journal is available for articles dealing with the fauna and flora of Burma, with myths connected with the fauna and flora, and with the geology. Articles should be typewritten. Illustrations, of which only a limited number will be allowed, should be drawn clearly and firmly with Indian ink on Bristol board, the lines being of sufficient thickness to allow of reduction. Plates and illustrations should be accompanied by short explanations.

References to authors in the text must be made in the following way:—"According to Smith (1900) the spleen is enlarged, but Robinson (1914) says the reverse" The references should be collected in alphabetical order of author's surnames at the end of the paper and arranged in the following way:—

Robinson, S. (1914). The spleen in malaria. *Ann. Med.*, 20, 20-25

Smith, J. (1900). Enlargement of the spleen in malaria. *Journ. soc. path. exot.*, 2, 275-567.

Contributors receive 25 copies of their paper free. Additional copies, not exceeding 200, may be had at cost price: these should be ordered on the form provided with the final proof.

If you wish to become a member or to propose a friend for membership, you are requested to sign the attached slip and forward it to the Hon. Secretary. If not, please pass on the forms to one of your friends.

BURMA RESEARCH SOCIETY.

Patron:

HIS EXCELLENCY THE GOVERNOR OF BURMA.

THE BURMA RESEARCH SOCIETY was founded in 1910. Its objects are the study and encouragement of Art, Science, History and Literature in relation to Burma, and the promotion of intercourse between members of different communities with a common interest in such objects. Meetings are held periodically at University College, Rangoon, at which papers are read. The principal work of the Society is the publication of a Journal, which appears thrice a year and is supplied free of charge to members. Articles by well-known scholars such as Messrs. C. O. Blagden, C. Duroiselle and R. Halliday have appeared in the Journal, but the Editor is chiefly dependent for contributions on Burmese and English members of the Society stationed in various parts of Burma. The articles are mostly on Burmese history, archaeology, literature, art, language, philosophy, religion and folklore. They are of interest not only to scholars but also to general readers who are attracted by Burma and its people. The Editor welcomes contributions from members who have made a study of any special subject or locality. Illustrated articles and articles in Burmese are always welcome. Apart from its Journal, the Society is also publishing Burmese literary and historical works and translations, and in this branch of its activity enjoys the assistance of the best Burmese scholars. It possesses a growing library for the use of members.

The Society is dependent for its funds entirely upon the subscriptions of members. The subscription is Rs. 15 yearly, payable in advance, or a single sum of Rs. 150.

The Society invites applications for membership. Anyone who desires to join, may ask a member to propose him, or may write to the HONORARY SECRETARY, BURMA RESEARCH SOCIETY (Bernard Free Library), RANGOON. The attached form may be used.

To

THE HONORARY SECRETARY,

Burma Research Society,

(Bernard Free Library), RANGOON.

* I propose for election as a member of the BURMA RESEARCH SOCIETY the name of.....Designation
.....Address.....

* I desire to be elected a member of the BURMA RESEARCH SOCIETY.

Name.....

Designation.....

Address.....

* Delete as circumstances require.

THE
GLASS PALACE CHRONICLE
OF THE
KINGS OF BURMA
(HMANNAN YAZAWIN).
TRANSLATED BY
PE MAUNG TIN

AND
G. H. LUCE,

PUBLISHED BY THE OXFORD UNIVERSITY PRESS
FOR THE TEXT PUBLICATION FUND OF THE BURMA RESEARCH SOCIETY

The *Glass Palace Chronicle*, the most important of the native histories of Burma, was compiled in 1829, by a committee of scholars appointed by King Bagyidaw of Burma, who based their work on earlier chronicles, inscriptions, and other ancient records.

The present translation omits the first two parts of the Chronicle, as they merely retell the story of Buddhism and of the Buddhist kings of Ancient India, and begins at the point where the story moves to Burma. The third part opens with the history of the three Burmese kingdoms of Tagaung, Tharehkittara and Pagan. The fourth and fifth parts of the present volume cover perhaps the most interesting period of Burmese history, that of the kingdom of Pagan—the city on the middle Irrawaddy, a hundred miles below Mandalay, whose noble temples and vast ruins still astonish visitors. The volume closes with the fall of Pagan (1287 A.D.), consequent on the invasion of Burma by the armies of Khublai Khan. It is hoped that the response to this publication will justify the Burma Research Society in continuing the translation and adding notes in subsequent volumes.

ORDER FORM FOR MEMBERS ONLY.

Special Reduced Price for Members of the B. R. S. Rs. 5 per copy
(in paper covers).

To

THE HONORARY SECRETARY,
Burma Research Society,
(Bernard Free Library), RANGOON.

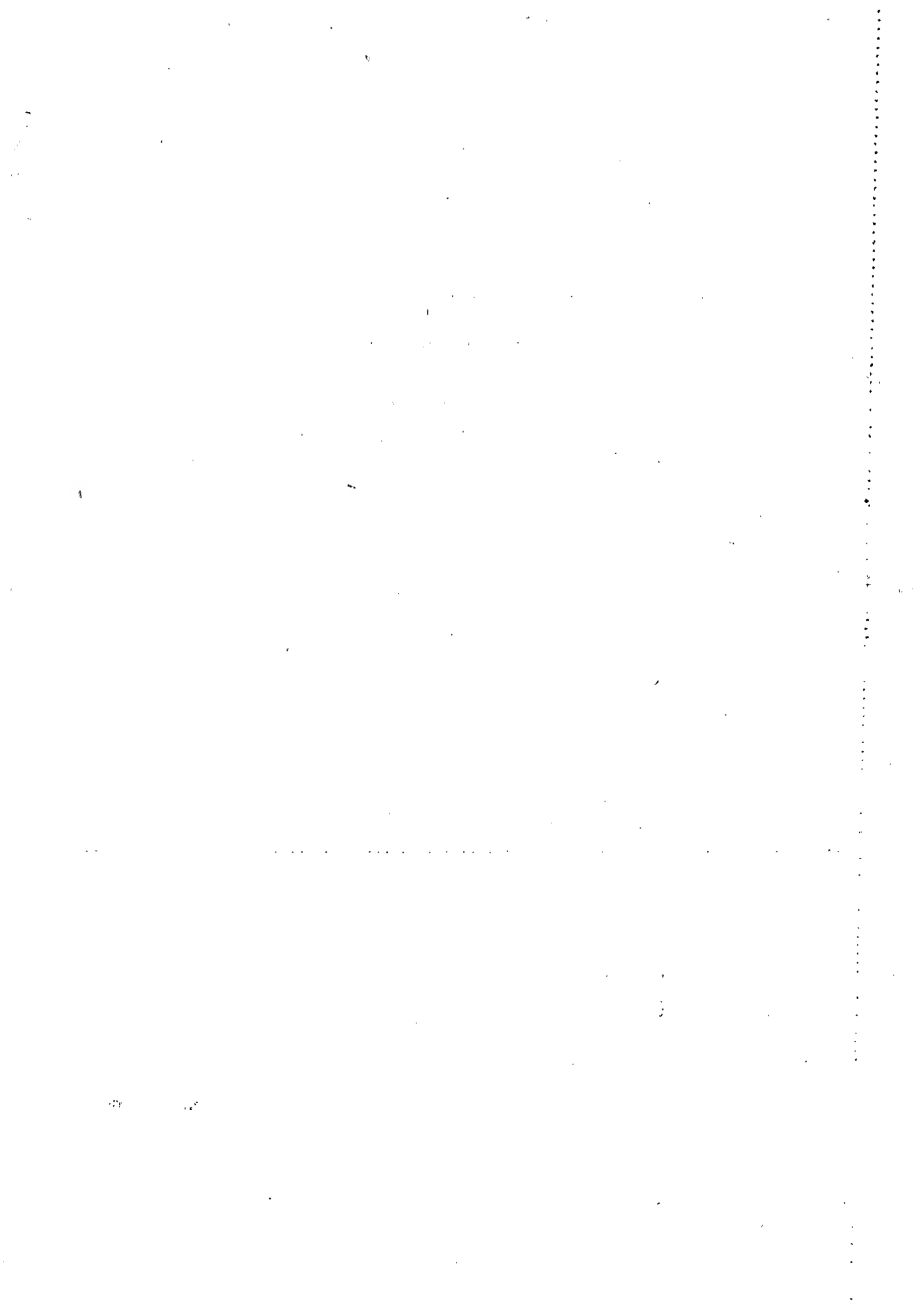
DEAR SIR,

I am a member of the Burma Research Society. Please send
me.....^{copy}
.....^{copies} of the translation of the Glass Palace Chronicle
V. P. P.,
for which I enclose the sum of Rs.....

Name.....

Designation.....

Address.....



THE BURMA RESEARCH SOCIETY.

(FOUNDED 1910)

For the Study and Encouragement of Arts, Science, History and Literature in relation to Burma.

PATRON.

HIS EXCELLENCY SIR SPENCER HARCOURT BUTLER,
G.C.I.E., K.C.S.I., I.C.S.

COUNCIL.

President.

THE HON'BLE SIR J. G. RUTLEDGE, KT., K.C., M.A., *Barrister-at-Law**

Vice-Presidents.

U SHWE ZAN AUNG, A.T.M., K.S.M.
THE HON'BLE MR. JUSTICE U BA, B.A., K.S.M.
J. S. FURNIVALL, ESQ., B.A., -I.C.S., (Retired).

Honorary Secretary.

U E MAUNG, M.A., LL.B., *Barrister-at-Law**

Honorary Treasurer.

A. CASSIM, ESQ., B.A.*

Honorary Editors and Librarians.

PROF. PE MAUNG TIN, M.A., B.LITT., I.E.S.*
PROF. F. J. MEGGITT, M.Sc., Ph.D., I.E.S.*

Executive Committee.

THE HON'BLE MR. JUSTICE	PROF. D. G. E. HALL, I.E.S.*
U MYA BU, <i>Barrister-at-Law</i>	S. G. Grantham, ESQ., I.C.S.
U TIN, K.S.M., A.T.M.	W. G. FRASER, ESQ., I.E.S.
L. F. TAYLOR, ESQ., M.A., I.E.S.	C. W. DUNN, ESQ., C.I.E., I.C.S.
DR. G. R. T., ROSS, I.E.S.	G. H. LUCE, ESQ., B.A., I.E.S.
U PO SEIN, A.T.M.*	D. B. PETCH, ESQ., I.C.S.
U TUN PE, M.A.*	U SET, B.A.
D. J. SLOSS, ESQ., M.A.	PROF. W. N. ELGOOD, I.E.S.

General Committee.

J. L. McCALLUM, ESQ., I.C.S.	R. C. J. SWINHOF, ESQ.
U THEIN	SAN SHWE BU, ESQ.
MAJOR C. M. ENRIQUEZ.	CH. DUROISELLE, ESQ., M.A.
U KYI O, B.A., A.T.M., K.S.M.	U THA TUN AUNG, B.A.
TAW SEIN KO, ESQ., C.I.E.	J. A. STEWART, ESQ., I.C.S.
H. F. SEARLE, ESQ., I.C.S.	U HLA, B.A.
Dr. O. HANSON.	U THA KIN.
G. E. HARVEY, ESQ., I.C.S.	

*Members of the Sub-Committee.

JOURNAL OF THE BURMA RESEARCH SOCIETY.

Vol. XVII, Part III.

C O N T E N T S .

Geology.	PAGES.
CHHIBBER, H. L.,—The ancient volcanoes of Burma ..	169
—————An Estimation of the Age of Mount Popa Deduced from Amount of Erosion of the Plateau on the West	174
CONNOR, J. P.,—The mud volcanoes of Minbu ..	176
STAMP, L. DUDLEY,—Notes on some fossiliferous localities in the Peguan rocks of Central Burma.	177
Zoology.	
MEGGITT, F. J., and SUBRAMANIAN, K.—The tapeworms of rodents of the sub-family Murinae, with special reference to those occurring in Rangoon	190
Botany.	
GHOSE, S. L.,—The Myxophyceae of Rangoon III ..	238
—————On a collection of Myxophyceae from Mergui and the neighbouring islands	244
—————On some Myxophyceae from Maymyo ..	252
HANDA, M. R.,—A note on two species of <i>Chaetophora</i> from Rangoon	257
—————A contribution to our knowledge of the Green Algae of Rangoon	259
KHANNA, L. P.,—The morphology of <i>Cyathodium tuberosum</i> Kashyap	270

THE ANCIENT VOLCANOES OF BURMA*

(Abstract)

BY

H. L. CHHIBBER, M.Sc., F.G.S., F.R.G.S.,
Lecturer in Geology and Geography, University College, Rangoon

It may be interesting to present a summary of the conclusions resulting from a four years study of the volcanic and allied rocks of Burma. The following eight communications have either been published or are ready for press :—

- (a) Stamp, L.D., and Chhibber, H. L. (1927). "The Igneous and Associated rocks of the Kabwet Area, Mandalay and Shwebo Districts, Burma. *Trans. Min. Geol. Inst. Ind.* XX, 97-128.
- (b) Pinfold, E. S., Day, A. E., Stamp, L. D., and Chhibber, H. L., (1927) "The late Tertiary Igneous Rocks of the Lower Chindwin Region", *Trans. Min. Geol. Inst. Ind.*, XXI, 146-225.
- (c) Chhibber, H. L. (1926). "The Rhyolites and Rhyolite Tuffs of Thaton District, Lower Burma". *Journ. Burma Res. Soc.* XVI, 166-175.
- (d) Chhibber, H. L. (1926), The Serpentine and the Associated Minerals of Henzada and Bassein Districts. *Journ. Burma Res. Soc.* XVI, 176-199.
- (e) Chhibber, H. L. (1927). "The Petrography of the Igneous Rocks of Mount Popa Region, Burma". *Trans. Min. Geol. Inst. Ind.* XXI. 226-310.
- (f) Chhibber, H. L. (1927). "The Intrusive Rocks of the Pegu Yomas". *Trans. Min. Geol. Inst. Ind.*
- (g) Chhibber, H. L. "The Volcanic Rocks of Myaungmya District Lower Burma (Ready for communication).
- (h) Chhibber, H. L. "Some of the volcanic and Associated Igneous Rocks of the Mergui Archipelago (In active preparation).
- (i) Chhibber, H. L. "The Hornblende Lamprophyres of Thaton District, Lower Burma", (Ready for communication).

In view of the material available it was deemed advisable to present a connected narrative of the present knowledge of the extinct volcanoes of Burma; the complete monograph is expected to appear shortly.

*Read [at the XIVth Indian Science Congress, Lahore.

Burma is unique in possessing an excellent record of volcanic activity during the early Palaeozoic and Tertiary periods of the earth's history. It may be said that, just as France has been the classic ground for the study of volcanoes in Europe, a similar position in the Indian Empire may be filled by Burma. In the Tertiary period alone volcanic activity was rife in at least at 9 centres in Burma, excluding the Teng Yüeh area in south-west Yunan. During these eruptions voluminous floods of lava and ashes were poured forth and the periods of volcanic activity were marked by long intervals of quiescence and by repeated renewals of volcanic energy.

The different centres comprised those of Loi Lan Lun in the Northern Shan States, the Mergui Archipelago, Kabwet area (Mandalay and Shwebe Districts), Thaton (near Mokpalin), Wintho, Lower Chindwin, Shinmadaung, Mount Popa and Myaungmya District besides those of the doleritic intrusions in the Pegu Yomas. At some of the centres groups of volcanoes are to be seen at the present day, *e.g.*, in the Lower Chindwin region alone 7 to 8 craters are to be seen, besides the several flows of lava, ash-beds, etc. In the Mount Popa area these are excellent records to show that several volcanoes erupted at different times during the late Tertiary period and their vestiges are scattered over an area of about 500 square miles. Mergui Archipelago, not unlike the Malay Arceipelago, was apparently another gigantic centre of igneous activity, where records of all kinds of igneous manifestation—volcanic, hypabyssal and plutonic—have been preserved in numerous islands out of a total of about 900.

The ancient volcanoes of Burma can be divided into two groups according to their age :—

- (1) Early Palaeozoic.
- (2) Tertiary.

The volcanoes of the first groups comprise those of Bawdwin in the Northern Shan States and the Lagwi Pass near the Burmo-Chinese frontier. The cessation of volcanic activity round Bawdin and the Lagwi Pass was followed by a period of remarkable volcanic quiescence which lasted throughout the later part of Palaeozoic and the whole of Mesozoic Eras. It was not until toward the end of the Mesozoic or the beginning of the Tertiary period that the subterranean fires once more awoke to vigorous action. At the same time the Arakan Yomas in the form of a long narrow island were upheaved from the bottom of the sea. As an accompaniment of the movement a belt of serpentine erupted, which runs from the Andaman Islands in the south to the frontier of Burma in the north. In passing it might be mentioned that some of the granite of Tavoy and Mergui belongs roughly to the same period. It was only in

late tertiary times that the colossal vents of Wuntho, Lower Chindwin, Mount Popa, Teng Yüeh, Kabwet, Mergui Archipelago, etc., broke forth and deluged the different parts of Burma with lava and other allied products.

The geographical distribution of the late tertiary volcanoes may be best understood if the main physical divisions of Burma are considered: these are:— (1) the plateau of Shan States and Yunan with Tenasserim Yomas in the south, (2) the central belt of Burma, (3) the Arakan Yomas and its continuation into the northern hills, (4) the Arakan coastal strip. It appears that the Tertiary volcanoes of Burma are connected with the above different orographical or physical features and can be divided into the following four well marked groups according to the geographical distribution:—

- (1) Those connected with the wrapping of the plateau of Yunan and Shan States and the Tenasserim Yomas. The volcanoes of Teng Yüeh, Loi Han Hun and some of the volcanoes of the Mergui Archipelago are situated on this line.
- (2) Those erupted along the edge of the Shan plateau and the Tenasserim Yomas *viz.*, the volcanoes of Kabwet, Malè etc. in Mandalay and Shwebo districts, the rhyolites and rhyolite tuffs of Thaton district and the volcanic rocks of the outer islands of the Mergui Archipelago, Lower Burma.
- (3) The volcanoes of the central line connected with the folding of the Pegu Yomas and their continuation into the northern hill ranges comprise those of Wuntho, the Lower Chindwin Shinmadaung, Mount Popa and the hypabyssal rocks of Prome and Tharrawaddy districts.
- (4) Those connected with the upheaval of the Arakan Yomas, *viz.* the volcanic rocks in the Irrawaddy delta, Myaungmya district. Sir Herney Hayden has recorded dolerites in Minbu district, which appear to lie on the same line. From the study of the serpentines in Henzada and Bassein districts the author has found there existed much igneous activity in the Arakan Yomas—a region which is still largely unexplored—as fragments of undoubted volcanic rocks, along with those of serpentine have been observed in microsections of the Nummulitic sandstones of Henzada district.

In conclusion it may be said that the volcanoes of Burma show a remarkable linear arrangement in a north-south direction. Up to the present an erroneous idea of a *single volcanic line* in Burma has prevailed; several prominent geologists, including Theobald and Burton, have repeatedly expressed the same ideas and widely divergent areas have been joined together to form one line. The writer is of the opinion that connected with the geotectonics of Burma are *four main* volcanic or

igneous lines in Burma as enumerated above. These lines have been depicted on a large sketch map, scale 1 in.=32 miles (Plate I).

The western igneous line, connected with the Arakan Yomas, Lushai and Patkoi hills in the north and the Andaman Islands in the south, passes on to Sumatra and Java while the igneous line connected with the plateau of Yunan, Shan States and their continuation into the Tenasserim Yomas passes on to the Malay Peninsula. The volcanic line situated along the edge of the Shan plateau and the Tenasserim Yomas is apparently continued to some of the outer islands of the Mergui Archipelago. It appears that the dormant volcano of Barren Island in the Bay of Bengal is a southern continuation of the volcanoes situated on the central volcanic line of Burma.

All the rocks situated on the central and western lines *viz.* those of the Lower Chindwin, Mount Popa, dolerites of the Pegu Yomas and also the volcanic rocks of Myaungmya district undoubtedly are calc-alkaline in composition or belong to the Pacific suite. The basalts of Loi Han Hun in the Northern Shan States are also calc-alkaline while the rocks of Teng Yüeh show an assemblage of both Atlantic and Pacific suites, whilst the rocks of Kabwet area (Mandalay and Shwebo districts) rhyolites of Thaton district and basaltic lava of Medaw Island, Mergui Archipelago, are undoubtedly alkaline and belong to the Atlantic province. The author has lately discovered 'hornblende lamprophyres characterised by a fairly large percentage of alkalis occurring as 'dyke-aocks' in the Mokpalin quarries, Thaton district. These lamprophyres are situated along the edge of the Tenasserim Yomas, which form a southern continuation of the Shan plateau.

It appears therefore that the rocks situated west of the edge of the edge of the Shan plateau are undoubtedly of a Pacific suite while those belonging to the Atlantic province exist along the edge of the Shan plateau and east of that, though in certain cases there appears to be an assemblage of the two suites.

It is remarkable that the volcanic rocks of Burma are comparatively acid in character and sometimes the rocks, especially the andesites or basalts, are so much on the border line, that it is extremely difficult to designate a rock. This difficulty was particularly experienced in the case of the Lower Chindwin and Mount Popa rocks, while Burton made the same remarks in connection with Teng Yüeh lavas.

The older lavas of Teng Yüeh area, S. W. Yunan and Mount Popa consists of bedded andesites. It appears from the study of other areas *viz.* Kabwet, Loi Han Hun, Teng Yüeh, Medaw, Mount Popa and the Lower Chindwin that the basalts belong to a later date of eruption than the andesites. The basalts of Teng Yüeh, Loi Han Hun, Medaw, Kabwet the Lower Chindwin and Mount Popa have proved to date from quite recent geological times.

It appears that the basic igneous rocks of Burma are of tertiary age and only the serpentines are of late Cretaceous to early Eocene age. There occur some intrusions of gabbro, etc. in the Shan States belonging to an earlier period.

There is one striking connection between the sites of the vents and topographical features. It has been observed that volcanoes have burst out along low grounds and valleys rather than ridges or hills. There is no doubt that all volcanoes of the Lower Chindwin region occur along the Chindwin valley, some in fact have broken out, it appears, across the river channel and narrowed its course.

The volcanoes of Wuntho have erupted close to the Irrawaddy valley. Its western boundary is marked by the Mu river.

Nothing is more convincing in this connection than the evidence provided by the volcanic eruption of Kabwet. There is not the least doubt that the lava was poured out across the valley of the Irrawaddy, the gorge-like appearance of which is simply due to the wall of lava built on one side.

Mount Popa appears to have begun its career under water as indicated by the stratified ash-beds seen at the base of the mountain.

The volcanoes of Teng Yüeh also appear to have welled out their lavas along the valley of the same name. Further the volcanoes of the Tertiary period have invariably burst out in close proximity to the sea or water. For instance, the volcanoes of the central belt have erupted at the site of the "Burmese Gulf" which was being silted up at that time. During the tertiary period, the edge of the Shan plateau formed the western shore line, while a like basin existed at the plateau itself of which the present Inle Lake is a shrunken remnant. There is not the least possible doubt that the Loi Han Hun and some of the volcanoes of Teng Yüeh forced their way through the Late Tertiary silts which were being deposited in the lakes. The same evidence is provided by the volcanic rocks of the Irrawaddy delta. The presence of *Nummulites* in oldest tuffs definitely shows that the Eocene volcanic activity was originally submarine.

Acknowledgements are due to the University of Rangoon for financing some of the investigations on the volcanic and allied rocks of Burma.

References.

- Chibber, H. L. (1927). "The Serpentines and the Associated Minerals of Henzada and Bassein districts, Burma." *Journ. Burma Res. Soc.*, XVI, 176-99.

An Estimation of the Age of Mount Popa, Deduced from the Amount of Erosion of the Plateau on the West

BY

H. L. CHHIBBER, M.Sc., F.G.S., F.R.G.S.

(Lecturer in Geology and Geography, University College, University of Rangoon.)

The present note really forms an appendix to the main paper on "The Igneous Rocks of Mount Popa Region, Burma" (Chhibber 1927). The author intended to include the present note in the above paper, but since he did not get an opportunity of correcting the proofs, chemical analyses of the important rock-types, geological map and sections will also be published in his monograph on the Ancient Volcanoes of Burma. Since the above paper was submitted for publication, the author re-visited Mount Popa in April, 1926, but unfortunately had to return prematurely on account of illness.

As already remarked in the paper cited above, the main mass of Mount Popa rests on a level plateau, roughly 800 ft. above the surrounding plains and about 1,800 ft. above the sea-level. This platform represents the surface-level of the land before the building up of the cone and has been preserved by the resistant capping of lava and tuff. As Dr. Pascoe has also noted, some of volcanic rocks *viz.*, Black Tuffs and Ashes, are interbedded with the Irrawaddian of Pliocene age proving that activity began in that period and continued subsequently in spasmodic eruptions. The plateau therefore affords a very remarkable gauge of the amount of erosion of the Irrawaddy series since their final deposition. Though the plateau subsists all round Mount Popa it is extremely well-marked on the west. By knowing the rate and amount of erosion it is possible to have approximately an idea of the time that has elapsed since the Pliocene period *i.e.* when Mount Popa was first active. It is noteworthy that no appreciable denudation of the Irrawaddy series took a place before its preservation as, plateau beneath the volcanic rocks, as exactly towards the end of the deposition of the Irrawaddy series the volcano appears to have been first active. The Black Tuffs and Ashes are either interbedded with the Irrawaddian with a small thickness of the sands above or are only seen at the top of the Irrawaddian.

The village of Popaywa, which almost stands in the centre of the plateau, is marked 1,907 ft. above sea-level on the one-inch map and, therefore, the average height of the plateau may be taken as 1,900 ft. Another point which is just at the edge of the plateau and from where

the steep descent begins, is marked 1,820 ft. The height of the neighbouring plain on which the plateau stands may be taken as 1,034 ft. above sea-level which gives an average of four points marked on the map :

- (1) 1001 ft. on Kyaukpadaung-Indaw road.
- (2) 839 ft. near Sanzu, about 4 miles south-east of Kyaukpadaung.
- (3) 1088 ft. on the Nyaunggon Gwedaukpin road.
- (4) 1208 ft. immediately west of the plateau.

Taking 1820 as the height of the plateau constituted by the Irrawaddians and 1,034 the average height of the plain, 786 ft. represent the amount of erosion of the Irrawaddians since their final deposition. F. J. Warth (1911) has calculated 413 years as required to erode 1 foot of rock in Mid-Burma from Mandalay to Prome. Multiplying 413 by 786 we get 324,618 years (or about $\frac{1}{3}$ million years in round figures) which gives approximately the time elapsed since the Pliocene period and *also when the subterranean fires of Mount Popa first saw daylight*. The minimum figure, however, will be $1820 - 1208 = 612$ by $407 = 252,756$ years. There may be some truth in the legend recorded by Bell that volcanic activity ceased only in historic times. Bell (1907) says: "According to tradition there was a great earthquake in 442 B. C. during which the great cone of Popa rose from the plains, but the native chronicles leave no record of how long it was active and when it became extinct". The author could not find any clue as to the date of last eruption within the memory of man.

It may be noted in conclusion that the erosion of the plateau must have been practically uniform since the climatic conditions, gradient of the plateau, after the Pliocene period as shown elsewhere, cannot have been very different from those of the present day.

References.

- Bell, N. C. (1907). "The Iron and Steel Work in Burma". Government Printing Press, Rangoon.
- Chhibber, H. L. (1926). "The Origin and Mineral Constitution of the Late Tertiary Fossil Wood of Burma". *Proc. Ind. Sci. Congr. Bombay. Journ. Proc. Asiat. Soc. Bengal*.
- Chhibber, H. L. (1927). "The Igneous rocks of Mount Popa Region, Burma". *Trans. Min. Geol. Inst. India*, XXI, 226-310.
- Pascoe, E. H. (1911). "Oilfields of Burma". *Min. Geol. Surv. Ind.* XL, 45.
- Warth, F. J. (1911). "Report on the Source, Supply and Agricultural Value of Silt in Burma". Rangoon.

THE MUD VOLCANOES OF MINBU

BY

J. P. CONNOR,

(Assistant Director, Land Records).

The mud volcanoes of Minbu are conical mounds, so called because of their resemblance to true volcanoes—though the eruptive force is not fire but petroleum gas given off by subterranean oil beds. Experimental borings for oil have been made in this neighbourhood but had to be abandoned after reaching a depth of 700 feet, owing to the existence of water. It is estimated that oil occurs at a depth of 2,000 feet. The cones are formed by the pressure of the gas which expels the liquid mud from below and deposits it around, thus forming a miniature crater. The escape of the gas, being retarded by the liquid mass of mud obstructing the passage, gathers strength and bursts up at intervals of a few seconds in large bubbles, the upward progress of which can be distinctly heard by muffled rumblings from the depths below. Occasionally the bursting of an unusually large bubble causes the contents of the crater to overflow and run down the sides like lava. Owing to the dry air and hot sun in those parts, the mud soon dries and adheres to the sides, thus causing the cone to grow with time. There are several such cones within a radius of a few hundred yards, varying in height from a little above ground level to about 50 feet.

The two most prominent cones are presided over by two "Nats" (Spirits) known as "Maungdaw" and "Nhitmadaw" (The Royal Brother and Sister) which names are applied to the cones themselves. Near by stands a "Natsin" (spirit house) for the use of the Nats.

A Natpwe (Festival) is held annually in June in their honour. These volcanoes are locally known as "Ngabwet Taung" (Dragon quagmire hills) and it is believed that Nagas (Dragons) who live in the waters below the earth cause the overflowing of the liquid by their wallowing down below.

The Nagas are a race of Demigods who formerly appeared on earth—no doubt a relic of ancient serpent worship. They have a king and country of their own and are accredited with supernatural powers. Evidence of their existence on earth is still found in the shape of nuggets of indurated sand which are said to be their droppings.

In 1247 B.E., 40 days before the arrival of the British Expeditionary force, a Naga appeared at the top of the Moungdaw or the cone. His advent was announced by rumblings and earthquakes, he was seen to turn and look to the 4 points of the compass as if to take a last farewell of his erstwhile haunts before the age of romance came to an end by the annexation of the country by unbelieving foreigners. The spectators of this scene fell down and begged for forgiveness of their shortcomings. The Naga then disappeared with similar commotion to that which accompanied his appearance. He is described as having a head like that of a horse and protruding saucer-like eyes.

NOTES ON SOME FOSSILIFEROUS LOCALITIES IN THE PEGUAN ROCKS OF CENTRAL BURMA.

BY

L. DUDLEY STAMP.

Reader in Economic Geography, London School of Economics.

I. Introduction.

From the latter part of 1921 to early in 1926 the writer was engaged at various times in the examination of the Peguan rocks in the Chindwin, Irrawaddy and Sittang valleys. In particular, practically the whole of the field season of 1922-23 was devoted to a study of the Peguan in the riverine tract between Prome and Yenangyaung. Some of the results of these investigations have been embodied in a series of papers dealing with special aspects. A plea has been entered for the recognition, in the Peguan sequence, of a Migyaungye Stage situated between the Singu Stage and the Kama Stage as interpreted by the Geological Survey of India. The object of the present communication is to place on record details of a number of fossiliferous localities which yielded the evidence for a Migyaungye. Future investigators will thereby be able more easily to check the hypotheses already formulated by the writer. The details are published by kind permission of the Indo-Burma Petroleum Co., Ltd.

II.—The classification of the Peguan of Burma.

The Peguan rocks of Burma in many places reach a measured thickness of upwards of 14,000 ft. This vast series of Oligo-miocene strata was separated by Vredenburg, on a palaeontological basis, into the following six stage (in descending order):—

6. Akauktaung Stage
5. Pyalo Stage
4. Kama Stage
3. Singu Stage
2. Padaung or Sitsayan Stage
1. Shwezetaw Stage

Of these the Akauktaung Stage does not come into the area studied by the writer. The evidence for the non-existence of a separate "Pyalo Stage" has been given elsewhere and it is suggested that, in the present state of knowledge, the following division may be recognised* :—

5. Kama Stage
4. Migyaungye Stage
3. Singu Stage
2. Padaung Stage
1. Shwezetaw Stage

* For further details see :—

Stamp : Seasonal Rhythum in the Tertiary Sediments of Burma. *Geol. Mag.*, 1925.

Stamp : Conditions governing the occurrence of oil in Burma. *Journs. Inst. Petr. Tech.*, 1927.

Although, as Mr. T. Dewhurst has pointed out in the discussion on the second paper quoted below, it is unfortunate that Vredenburg based his classification on faunas from inliers (Yenangyat, Singu and Minbu) it is desirable, as far as possible to continue the use of divisions already established. Vredenburg studied in particular what he calls the standard faunas of Yenangyat, Minbu, Singu and Kama and on this examination based his division of the Peguan into stages.

III.—The Faunas from new localities in the Riverine Tract.

All the species recorded below are named from specimens preserved in the geological collection of the Indo-Burma Petroleum Co., Ltd. No adequate descriptions exist of the Peguan lamellibranchs or holostomatous gastropods, consequently only the Siphonostomata are listed, together with the holostomata of the *Turritella* group.

In the case of each species of the Siphonostomata the occurrence in the Standard Fauna is indicated by letters thus:—Y = Yenangyat; M = Minbu; S = Singu; K = Kama. This is the principal evidence for the assignation of the new faunas to the different stages as indicated below but brief notes are added on the other groups of molluscs and the evidence which they afford.

Sheet 157 (85M/1-5).

1. *Minhla*. *Arca* beds to the north of the town* Estimated to be about 700 feet below the local top of the Pegnan.

<i>Olivancillaria</i> (<i>Agaronia nebulosa</i>) var. <i>pupa</i> Sow.	S.
<i>Turritella magnasperula</i> Sacco	Y.M.S.

This is the *Arca* Facies fauna, characterized by the abundance of *Arca submultiformis* fide Vred. Another character fossil is the Kama form, *Arca theobaldi* Noet. By analogy with other faunas in the immediate neighbourhood and by the presence of two characteristic Singu forms with a typical Kama, this fauna is referred to the Migyaungye Stage

2. *Minhla*.—From a hard coarse sandstone near the top of the Lebyingyin Sandstone Group.* In the chaung just west of the Trigonometrical station 216 on the road from Minhla to Tagaing. Estimated to be 2,400 ft. below the local top of the Peguan.

<i>Terebra</i> (<i>Myurella</i>) <i>hornelli</i> Vred.	(Dalabe etc.)
<i>Surcula</i> <i>Sethuramae</i> Vred.	(Dalabe etc.)
<i>Olivancillaria</i> (<i>Agaronia</i>) <i>nebulosa</i> var. <i>pupa</i> Sow.	S.
<i>Cryptospira birmanica</i> Vred.	K.
<i>Cassidea birmanica</i> Vred.	S.

This fauna, small though it is, is typical of the Migyaungye Stage, including as it does, forms characteristic of both the Singu and Kama stages.

* For a map showing the local lithological divisions, see Stamp, *Op. cit. sup.*

STAMP—SOME FOSSILIFEROUS LOCALITIES IN PEGUAN ROCKS.

3. *Minhla*.—A hard band in the *Dendrophyllia* Clays, just north of the road from Minhla to Tagaing and two miles west of the P. W. D. Bungalow at Minhla. Estimated to be 1,500 ft. below the local top of the Peguan. Corals and gastropods are abundant.

Turritella angulata Sow. 1-ribbed form. SK.

Turritella angulata Sow. 2-ribbed form. K.

From its position this fauna belongs to the Migyaungye stage,

4. *Minhla*.—Fossiliferous sands at the top of the cliff about 200 yards south of the old fort opposite Minhla. In the *Arca* Sandstone Group at an estimated distance of 1,800 ft. below the local top of the Peguan. There are no gastropods in the author's collection from this locality, but of the seven lamellibranchs, four are Kama forms, including one (*Tellina hilli*) common also to Yenangyat and Minbu; one is a Singu form, one is new and the other is *Arca submultiformis*. Since lamellibranchs are far more numerous in the Kama than the other faunas, this fauna may be considered as characterically intermediate between the Singu and Kama faunas; in other words it belongs to the Migyaungye Stage.

5. *Malun*.—Two faunas from the Tagaing Clays may be considered together. One comes from the top of the clays at an estimated distance of 3,870 ft. below the local top of the Peguan, near the top of a small scarp $\frac{3}{4}$ mile west-south-west of Malun; the other from about the middle of the clays one mile south of Malun, at an estimated distance of 4,500 ft. below the top of the Peguan.

Conus (Lithoconus) odengensis var. *awaensis* Noet. MS

Conus (Lithoconus) ineditus Mich. YMS

Oliva (Strephona) australis var. *indica* Vred. K

Ranella sp. nov. (Dalabe L. D. S.)

Pirula promensis Vred. K.

Pirula condita Brongn. Y. S?

This is a typical Migyaungye Stage fauna—rather older than the previous ones examined. The five lamellibranchs recorded confirm its intermediary character between the Singu and Kama faunas.

6. *Migyaungye*.—A small local fossil bed near the top of the Tagaing Clays was examined. It is situated at an estimated distance of 3,000 ft. below the top of Peguan. It is seen in a roadside exposure $1\frac{1}{2}$ miles north-west of the P.W.D. bungalow.

Terebra (Myurella) myuros var. *obeliscus* Vred. (Dalabe etc.)

Terebra (Myurella) protomyuros Noet. K.

Terebra dalabeensis Vred. (Dalabe etc.)

Pleurotoma (Hemipleurotoma) sp. nov. aff. *iris* Vred.

Pleurotoma (Gemmula) birmanica Vred.

Conus (Leptoconus) protofurvus Noet. YSK.

Conus (Leptoconus) hanza Noet. K.

<i>Conus (Chelyconus) minbuensis</i> Vred.	M.
<i>Clavilithes seminudus</i> Noet.	YMS.
<i>Siphonalia subspadicea</i> Vred.	
<i>Cassidea birmanica</i> Vred.	MS.
<i>Ranella tubercularis</i> Noet. sec. Vred.	YM.
<i>Ranella promensis</i> Vred.	K.
<i>Turritella angulata</i> Sow. many ribbed form.	
<i>Turritella angulata</i> Sow. 1-ribbed form.	SK.

This is a fauna typical of the Migyaungye Stage. Well known Singu and Kama forms occur intermingled, with a slight preponderance in this case of the latter. Amongst the nine other forms recorded is the Kama form *Parallelipipedum prototortuosum*. Of the others, three are Singu form, two are Kama and two are new, the ninth, *Xenophora birmanica*, was described by Noetling from Thayetmyo. A fauna from "Migyaungye" has been noted by Vredenburg as Singu. The town itself is situated on alluvium and without more precise indications it is impossible to fix the stratigraphical horizon of Vredenburg's fauna.

7. *Migyaungye*.—A hard fossiliferous band in the Myebye Chaung, just north of the 30th milestone on the Taungwingyi Road and 2.2 miles north-east of the Migyaungye Rest House. Possibly about 1,620 ft. below the local top of the Peguan.

<i>Turritella angulata</i> Sow. many-ribbed form.	
<i>Turritella angulata</i> Sow. 1-ribbed form.	SK.
<i>Turritella angulata</i> Sow. 2-ribbed form.	K.
<i>Turritella lyddekeri</i> Noet. (a Singu form)	

The majority of fossils from this locality are lamellibranchs (9) and include three or four apparently undescribed species. The others are mainly common to Singu and Kama. The evidence seems sufficient for assigning this fauna to the Migyaungye Stage.

8. *Thabutkyaw*.—There are several soft sandy beds in the stream course at varying distances west of the village, but notably at 1, 1.2 and 1.5 miles west. The beds are estimated to be 1,600, 2,000, and 2,300 ft. respectively below the local top of the Peguan and fall into the Upper Mixed Group. Although only one siphonostomatous gastropod:—

<i>Cassidaria echinophoria</i> var. <i>promensis</i> Vred.	K.
--	----

occurs the fauna of lamellibranchs is absolutely typical of the Kama Stage. Out of the 13 which have been named 11 occur at Kama; of the 4 which may be new species all have been found by the writer at Dalabe or elsewhere in typical Kama beds including one from the type locality at Kama. This is the most northerly occurrence of a typical Kama fauna,

STAMP—SOME FOSSILIFEROUS LOCALITIES IN PEGUAN ROCKS.

9. *Tagaing*.—Although this village is situated in Sheet 113 some miles from the border of Sheet 157, its fauna has an important bearing on the general geology of the Minhla area and is therefore noted here. The fauna was obtained from a claystone conglomerate which seems here to form the junction bed between Tagaing Mixed Group and the Tagaing Clays. The bed is exposed at the top of the cliff east of the village. The fauna includes :—

<i>Conus (Lithoconus) odengensis</i> var. <i>avaensis</i> Noet.	MS.
<i>Cassidaria echinophoria</i> var. <i>monilifera</i> .	S.
<i>Melongena acanthina</i> Dalton ?	? S.
<i>Pirula condita</i> Brongn.	Y.
<i>Pirula promensis</i> Vred.	K.

The lamellibranchs include the typically Singu form of *Tellina (Mctis) grimesi* and a species of *Tellina* apparently identical with one commonly found at the top of the Padaung Clays at Ngahlaingdwin. This fauna is considered as belonging to the Singu Stage.

SHEET 158 (85M/2-9).

10. *Sinbaungwe*.—The highest fossil bed studied occurs a few hundred feet below the Irrawadian in the Sinbaungwe Chaung. It is a soft sandy bed and contains the *Arca submultiformis* facies fauna. There is a strong suggestion—as other evidence shows must almost certainly be the case—in the presence of the spinose form of *Cardita viquesneli* that this fauna occurs in the Kama Stage, whereas the *Arca* facies fauna of Minhla belongs to the higher part of the Migyaungye Stage.

11. *Sinbaungwe*.—In the Sinbaungwe Chaung at distances of 1.4 and 1.45 miles east of the Sinbaungwe Rest House there occur two hard fossil bands in the midst of shales of Sitsayan type (Sinbaungwe Shales). They are estimated to occur at 2,800 and 2,820 feet below the local top of the Peguan. The fauna includes :—

<i>Terebra (Myurella) myuros</i> var. <i>obeliscus</i> Vred.	(Dalabe etc.)
<i>Conus (Leptoconus) bonneti</i> Cossmann.	K.
<i>Conus (Lithoconus) odengensis</i> var. <i>avaensis</i> Noet.	MS.
<i>Olivella minbuensis</i> Vred.	YM.
<i>Cryptospira birmanica</i> Vred.	K.
<i>Clavilithes seminudus</i> Noet.	YMS.
<i>Cassidea birmanica</i> Vred.	MS.
<i>Cassidaria echinophoria</i> var. <i>promensis</i> Vred.	K.
<i>Persona reticulata</i> Linn. var.	? S.
<i>Turritella angulata</i> Sow. many-ribbed form.	
<i>Turritella angulata</i> Sow. 1-ribbed form.	SK.
<i>Turritella angulata</i> Sow. 2-ribbed form,	K.

The mixture of typical Singu and Kama forms is indicative of the Migyaungye Stage. Of the species listed above it may be noted that 6 occur in the Kama Stage; 5 at Singu; 4 at Minbu and 2 at Yenangyat. It is superfluous to remark how well these figures confirm the grouping of the standard faunas adopted by Vredenburg. Apart from the above, 11 fossils have been provisionally named, 8 occur at Kama, 7 at Singu, 3 at Minbu and 3 at Yenangyat.

12. *Inlat*.—A few fossils besides crustaceans were found in the "Crustacean Bed" which represents the final attenuation of the Padidaung Sandstone and which occurs approximately in the position "*Dendrophyllia Bed*" recorded on the survey maps. They include *Clavilithes seminudus* (YMS) and the *Tellina* sp. noted above from Tagaing as a Singu-*Ngahlaingdwin* form. This horizon is estimated to be 5,000 feet below the local top of the Peguan and is placed in the Singu Stage.

13. *Zaungyaundaung*.—Immediately to the west of the village (especially to the north-west) there is a series of strike ridges which are the result of hard bands in the mass of clays of Sitsayan type. Many of these bands are fossiliferous and fossils were collected especially at points distant 0.3 and 0.35 miles west of the Hpongyi Kyaung (Monastery) at the northern end of the village. The beds are estimated to be 6,000 to 6,500 ft. below the local top of the Peguan.

<i>Terebra (Subula) noetlingi</i> Vred.	M.
<i>Drillia</i> sp. nov.	
<i>Conus (Lithoconus) ineditus</i> Mich.	YMS
<i>Mitra singuensis</i> vred	S.
<i>Melongena acanthina</i> Dalton	S.
<i>Melongena praeponderosa</i> Noet.	S.
<i>Siphonalia iravadica</i> Vred.	M.
<i>Cassidaria echinophoria</i> var. <i>monilifera</i> .	S.
<i>Pirula condita</i> Brongn.	Y.
<i>Cypraea (Cypraeotrivia) oppenheimi</i> Vred.	XM.
<i>Turritella angulata</i> Sow. 1-ribbed form	SK.
<i>Turritella angulata</i> Sow. 2-ribbed form	K.

It will be seen that the fauna is essentially one of the Singu Stage, but the presence of several typical Yenangyat-Minbu forms of *Turritella angulata* occur and the presence of numerous examples of the 2-ribbed form in a Singu fauna points to the fact that this fossil is to a considerable extent indicative of this horizon, though it is not recorded from Singu itself. This is of interest since it is one of the few fossils recorded from the bulk of the Sitsayan Shales near Thayetmyo. The Zaunggyandaung faunas agree with those of Singu itself in the general paucity of lamellibranchs.

An *Ostrea* is abundant in many bands both here and slightly to the south at Inma and a *Tellina* occurs.

STAMP—SOME FOSSILIFEROUS LOCALITIES IN PEGUAN ROCKS.

14. *Zaunggyandaung Hills*.—From a locality in the hills to the west of the village a villager had collected numerous examples of the typical Yenangyat fossil, *Verica* (*Cancellaria*) *pseudocancellata* Noet., together with a Singu form of *Scalardia*. The horizon would probably be some 4,000 or 5,000 ft. below the last mentioned locality.

15. *Chaungtha*.—In the original survey only two or three fossils were obtained from near the base of the exposed Peguan in the stream-course about $\frac{1}{4}$ mile east of the village. This horizon was estimated to be 12,000 ft. below the local top of the Peguan.

<i>Genotia irravadica</i> Noet.	MS.
<i>Melongena pseudobucephala</i> Noet.	S.
<i>Pirula condita</i> Brongn.	Y.

The writer afterwards studied this area in detail and made collections from three beds occurring at the junction of the Chaungtha Clasy and overlying sandy beds. The faunas of the three beds may be considered together :—

<i>Terebra aff quettensis</i> Vred.	?S.
<i>Drillia protointerrupta</i> Noet.	M.
<i>Clavatula protonodifera</i> Noet.	MS.
<i>Surcula feddeni</i> Noet.	YMS.
<i>Athleta (Volutospina) jacobsi</i> Vred.	YMS.
<i>Hindsia birmanica</i> Vred.	YM.
<i>Lathyrus (Peristernia) sp ?</i>	
<i>Pirula condita</i> Brongn. (? var.)	Y.
<i>Olivancillaria nebulosa</i> var <i>pupa</i> Sow.	?YS.
<i>Turritella magnasperula</i> ?	YMS.

These faunas unquestionably belong to the Padaung Stage, which includes the Yenangyat and Minbu faunas. Whilst the lists seem to show strong affinities with the Singu faunas, it should be noted that very many of the typical Singu forms are absent. Other typical Padaung Stage species present include *Torinia buddha* (YM) *Pectea irravadicus* (YMS) and *Cardium minbuense* (MS.) On the faulted western limit of the Chaungtha fold, in the midst of the Lower Sandy Group a richly fossiliferous bed was found in the Wetkyat Chaung (NNE of Chaungtha village) with the following fauna :—

<i>Surcula feddeni</i> Noet.	YMS.
<i>Clavatula protonodifera</i> Noet.	MS.
<i>Genotia singuensis</i> Vred.	S.
<i>Conus ineditus</i> Mich.	YMS.
<i>Athleta (Volutospina) jacobsi</i> Vred.	YMS.
<i>Oliva minbuensis</i> Vred.	YMS.
<i>Olivancillaria nebulosa</i> ? (var.)	—
<i>Clavilithes seminuudes</i> Noet.	YMS.
<i>Tritonidea martiniana</i> Noet.	YMS.
<i>Cassid aff preangerensis</i> (Mart) (Java)	

This again is Padaung fauna.

16. *Dalabe*.—Many of the now well known richly fossiliferous localities of Eastern Thayetmyo are situated in the sheet under consideration. A detailed survey was made of the chaung or stream which runs from the Irrawadian to the north-east of Dalabe, past the two villages of that name and, after a further course of some dozen miles, into the Irrawaddy above Nyaungbintha. It may be of some use to record the faunas collected. The first was obtained from a bed exposed in the chaung a short 100 ft. from the top of the Peguan. It comprised

Surcula sethuramae Vred.

Drillia cf. *buddhaica* Vred.

Trigonostoma birmanica Vred.

Cryptospira birmanica Vred. K.

Cythere pretiosa Vred.

Phos acuminata Martin var. *bimanica* Vred.

Rimella javana Martin K.

In addition 10 lamellibranchs have been named. This fauna is an impoverished representative of the one from the lower horizon. In the chaung just north of the eastern end of Dalabe ashezu village is exposed a very rich fossil-bed. It is a soft glauconitic sand and the fossils are beautifully preserved. The bed is estimated to be 900 ft. below the local top of the Peguan. The fossils collected include:—

Terebra (*Duplicaria*) *smithi* Noet. sec. Vred.

Terebra (*Myurella*) *martini* Vred.

Terebra (*Myurella*) *hornelli* Vred.

Terebra (*Hastula*) cf. *pagoda* Vred.

Terebras (*Hastula*) *herklotsi* Mart. var. *arundinea* Vred. ?

Surcula sethuramae Vred.

Surcula (*Pleurofusua*) *iravabica* Vred.

Surcula (*Pleurofusua*) *phasma* Vred.

Bathytoma cataphracta Brocchi sec. Vred.

Bathytoma aff. *herklotsi* Martin sec. Vred.

Conus (*Leptoconus*) *vimineus* Reeve sec. Vred.

Conus (*Leptoconus*) *yuleianus* Noet sec. Vred.

Conus (*Lithoconus*) *dengensis* Martin sec. Vred.

Conus (*Lithoconus*) *decellatus* Martin sec. Vred.

Conus (*Dendroconus*) *hochatetteri* Martin sec. Vred.

Oliva (*Strephona*) *australis* Duclos var. *indica* Vred. K.

Cryptospira birmanica Vred. K.

Clavilithes seminudus Noet. YMS.

Tritonidea promensis Vred.

Cassidaria echinophoria var. *promensis* Vred. K.

Murex (*Typhis*) sp. nov.

Pirula sp. nov.

Ranella sp. nov.

Ranella aff. *promensis* Vred. K.

Hindsia neacolubrina Noet. K.

STAMP—SOME FOSSILIFEROUS LOCALITIES IN PEGUAN ROCKS.

<i>Rimella javana</i> Martin sec. Vred.	K.
<i>Rimella promensis</i> Vred.	K.
<i>Turritella angulata</i> Sow. many-ribbed form.	
<i>Turritella angulata</i> Sow 1-ribbed form.	K.
<i>Turritella angulata</i> Sow. 2-ribbed form.	K.
<i>Turritella</i> sp. nov.	

It may be thought that rather a large number of the forms recorded above do not occur at Kama itself, considering that the Dalabe and Kama faunas belong to the same stage. But it must be remembered that the new faunas from Dalabe, Tittabwe, Myaukmigon etc. are very large, including more than 200 species of Siphonostomata alone and that only two of the Kama forms have not yet been found amongst the collections from the new localities. In addition to the above detailed Siphonostomata 25 lamellibranchs have been named; three of these seem to be new but of the remaining 22 no less than 19 occur at Kama.

At a considerably lower horizon in the Dalabe Chaung, not far above the junction of the Upper Group with the beds of Sitsayan type, several specimens of the Singu-Migyaungye form *Vicarya verneuili*, were found. SHEET 159 (85M/3-7)

17. *Sinde*.—On the river bank between Sinde and Myinba, north of Thayetmyo there are several bands of hard sandstone in the midst of the Sitsayan Shales. One of these yielded abundant fine specimens of

<i>Melongena pseudobucephala</i> Noet.	S
<i>Melongena acanthina</i> Dalton	S

Both of these are typical forms of the Singu fauna. It was from Letpanzeik, a few miles further south and lithologically at a slightly higher horizon that Vredenburg recorded a small Singu fauna comprising:—

<i>Terebra quettensis</i> Vred.	S
<i>Surcula fusus</i> Vred.	
<i>Tritonidea martiniana</i> Noet.	MS.

Though small, the fauna is very typical.

18. *Thanat*.—A soft sandy fossil-bed occurring only a few feet below the Irrawadian junction is exposed in the small chaung immediately under the south-eastern corner of Thanat village (about 5 miles east of Allanmyo). The bed is very rich in lamellibranchs, but only one siphonostomatous gastropod occurs:—

Trigonostoma birmanicum Vred.

Of the 12 species of lamellibranchs which have been named, all except two occur at Kama and all except two at Dalabe. This proves the bed to belong to the Kama Stage and demonstrates the impossibility of distinguishing a separate stage above the Kama Stage in this locality.

19. *Thayetmyo*.—The most important fauna examined from near Thayetmyo is one from a hard band, exposed on the river bank near

the village of Pondaung and estimated to be 1,300 ft. below the local top of the Peguan. The fossils include:—

<i>Terebra</i> sp. nov. aff. <i>butacana</i> Vred.	
<i>Terebra</i> sp. nov. aff. <i>cossmanni</i> Vred.	
<i>Conus</i> (<i>Leptoconus</i>) <i>bonneti</i> Cossm.	K
<i>Conus</i> (<i>Lithoconus</i>) <i>ineditus</i> Mich.	YMS.
<i>Olivæ</i> (<i>Strephona</i>) <i>australis</i> var. <i>indica</i> Vred.	K.
<i>Volvaria birmanica</i> Noet.	
<i>Pirula promensis</i> Vred.	
<i>Rostellaria</i> cf. <i>curta</i>	
<i>Turritella angulata</i> Sow. many-ribbed form	
<i>Turritella angulata</i> Sow. 1-ribbed form	SK.

This fauna is considered to belong to the higher part of the Migyaungye Stage, since it shows a mixture of Singu and Kama forms, with a majority of the latter, Noetling's Zones of *Pholas orientalis* and *Aricia humerosa* probably belong to approximately the same position. The lamellibranchs also exhibit the admixture of Singu and Kama forms, but there are several peculiar to the locality as there are in Noetling's collections from Thayetmyo. Other fossils from the Thayetmyo neighbourhood have been noted above.

SHEET 160 (85M/4-8)

20. *Pyalo*. Despite the fact that very careful search was made for evidence of a separate and distinct "Pyalo Stage" overlying the Kama Stage, it must be admitted that the differences noted in the faunas of the very highest Peguan scarcely warrant the separation of a distinct stage. Faunas were examined from Pyalo itself from few dozen feet below the Irrawadian whilst at Thanat (east of Allanmyo) the rich fauna noted above was found but a few feet below the junction. Both faunas are typical of the Kama Stage and the same is true of the faunas from Kamagle. (see below). The latter locality is opposite Kama and the fossils come from the highest Peguan, that is some 2300 ft. above the type locality of the Kama fauna. The main difference between these faunas which must be regarded as from the higher part of the Kama Stage and the typical Kama faunas lies in the abundance, almost to the exclusion of the normal form, of the spinose variety of *Cardita viquesneli*. The Pyalo Stage, founded, as it was, on the presence of *Ostrea latimarginata* would seem to indicate the danger of using members of the genus *Ostrea* as zonal forms without examining the evidence with the greatest of care. The writer is indebted to Mr. G. H. Lepper, B.Sc., M.I.P.T., of the Burma Oil Co., Ltd., for information as to the exact locality from which the specimens of *Ostrea latimarginata* were obtained. The bed is situated in the stream immediately north-west of Sitsaba village. Both above and below are other fossil beds which, from specimens seen by the writer, appear to yield typical Kama faunas

STAMP—SOME FOSSILIFEROUS LOCALITIES IN PEGUAN ROCKS.

21. *Kamagale*.—From sandy beds at 200 and 250 ft. below the Irrawadian base on the river bank by Kamagale, opposite Kama, the following were collected:—

<i>Conus</i> (<i>Lithoconus</i>) <i>odengensis</i> Martin (Dalabe etc).	
<i>Oliva</i> (<i>Strephona</i>) <i>australis</i> var. <i>indica</i> Vred	K.
<i>Olivancillaria</i> (<i>Agaronia</i>) <i>nebulosa</i> var. <i>pupa</i> Sow.	M.

In addition there are 8 named lamellibranchs, 7 of which are typical Kama forms including *Parallelipipedum prototortuosum*. The occurrence of the Minbu *Oliva* so high up is curious, but the species is one which still exists at the present day and the differences which mark off the extinct variety are not great.

22. *Kama*. Ten of the characteristic Kama species were collected at the old type locality of the Kama Clay.
SHEET 112 (84L/12-16).

23. *Pyawbwe*. The little old Rest House is situated near the top of a high river-cliff. At the base of the cliff, slightly to the south-east there is a soft sandy fossiliferous bed, situated roughly at the top of the Padaung Clays of this region. The fauna includes :—

<i>Surcula</i> (<i>Pleurofusua</i>) <i>feddeni</i> Noet.	YMS.
<i>Athleta</i> (<i>Volutoospina</i>) <i>jacobsi</i> Vred.	YMS.
<i>Tritonidea martiniana</i> Noet.	YMS.
<i>Tritonidea martiniana</i> Noet. var.	
<i>Turritella magnasperula</i> Sacco	YMS.
<i>Turritella augulata</i> Sow. 1-ribbed form	S.

This fauna obviously belongs either to the Padaung or Singu Stages and is assigned, partly from the presence of the last mentioned fossil,* to the base of the Singu Stages.

SHEET 113 (851/9-18).

24. *Magyisan*. This fauna was collected from a sandy bed in the midst of the shales which here represent the Shwezetaw Sandstone. The bed is exposed in the chaung to the south-west of the village and is situated about 1500 feet above the Kyet-u-bok Bed (which is to be seen in the same chaung) and thus probably about 12,000 feet below the local top of the Peguan. The interest of the fauna lies in the large number of undescribed species—as one would expect from a bed on this horizon.

* The many-ribbed form of this species does, however, occur in the Padaung clays as recorded by Cotter.

Horizon :—

- Terebra* sp. nov. cf. *stuarti* Vred.
Terebra sp. nov.
Pleurotoma sp. nov. aff. *albinoides* Martin
Pleurotoma sp. nov.
Pleurotoma (*Memipleurotoma*) sp. nov. aff. *iris* Vred.
Pleurotoma (*Gemmula*) *birmanica* Vred.?
Drillia sp. nov. aff. *pinfoldi* Vred.
Bathytoma sp. nov.
Canus (*Lithoconus*) *gracilispira* Boettger (Eocene, Yaw Stage)
Athleta (*Volutospina*) *jacobsi* Vred YMS.
Clavilithes seminudus Noet YMS.
Pirula sp. nov.
Cypraea sp.

It will be noticed that of the three species which occur elsewhere, one is a Yaw Stage (Eocene) form, the other two are common in the overlying stage of the Peguan. Like the Dalabe and associated beds the Magyisan bed has a "Pleurotoma Shale" facies but the species are quite different.

Apart from the faunas detailed above, many other small faunas or isolated specimens have been examined. In some cases only lamelli-branches were present, in other cases the preservation of all fossils was poor. In the lists which were originally prepared both gastropods and lamelli-branches were taken into consideration. A study of the evidence afforded by the lists of Siphonostomata given here will show that it is impossible to group the "Standard Faunas" other than in the sequence given by Vredenburg, but they illustrate the overlapping of Singu and Kama forms characteristic of the Migyangye Stage. The lists, therefore, may be termed convincing but if the Hdostomata and Lamelli-branchiata be also included the conviction becomes absolute. However, at the risk of some loss on this point, it has been deemed unwise to include the latter groups until a careful palaeontological revision of them can be undertaken. The perpetuation of old incorrect determinations and the use of many *nomina nuda* have thus been avoided.

All the specimens mentioned above, with the exception of the series from Pyawbwe and Magyisan, which are in the writer's own collection, are preserved in the Collection of Messrs. The Indo-Burma Petroleum Company, Limited, Rangoon.

For the sake of comparison the following list of fossils from Yenangyaung has been drawn up. They are from Pascoe's Taung-hnit-lon and Natsin-Yo beds (List revised from Mem. Geol. Surv. India., Vol. XL. pt. 1, pp. 59-60 and 61-62).

STAMP—SOME FOSSILIFEROUS LOCALITIES IN PEGUAN ROCKS

<i>Terebra (Subula) noetlingi</i> Vred.	M.
<i>Terebra (Noditerebra) samaranga</i> Martin	K.
<i>Surcula carenaica</i> Noet.	K.
<i>Surcula (Pleurofusua) feddeni</i> Noet.	YMS.
<i>Conus (Lithocous) ineaitus</i> Mich.	YMS.
<i>Conus (Conospira) galensis</i> Noet.	YS.
<i>Olivella minbuensis</i> Vred	YM.
<i>Melongena pseudobucephala</i> Noet.	S.
<i>Lathyrus (Peristernia) gautama</i> Noet.	K.
<i>Pirula condita</i> Brongh.	Y.
<i>Cassidaria echinophoria</i> var <i>monilifera</i> Noet.	S.
<i>Turritella angulata</i> Sow. 1-ribbed form.	SK.
<i>Turritella angulata</i> Sow. 2-ribbed form.	K.

This fauna is a mixture of Singu and Kama species, typical of the Migyaungye stage, in this case rather the lower part. The lamellibranchs show greater affinity with Kama, no less than 16 out of the 22 recorded being known from Kama.

THE TAPEWORMS OF RODENTS OF THE SUBFAMILY MURINAE, WITH SPECIAL REFERENCE TO THOSE OCCURRING IN RANGOON

BY

F. J. MEGGITT

AND

K. SUBRAMANIAN.

(University of Rangoon)

CONTENTS

I—Introduction	..	..	..	..	..	190
II—Systematic	..	..	..	..	..	195
III—Key to cestodes of rats	..	..	..	..	..	225
IV—List of hosts	..	..	..	..	..	227
V—Literature	..	..	..	..	..	233

Introduction.

The purport of the paper is explained by its title. Although various lists (Shipley 1908, Moll 1917, etc.) of rat parasites have been published the descriptions of the species recorded have never been collected into a single work. In addition, the parasites of Indian rats have been completely neglected. The investigation of the rat tapeworms of Rangoon was therefore undertaken with a double purpose. One, that of presenting a descriptive list of rat cestodes, has been accomplished in the present paper: the time was too short for the other—that of recording the rat cestodes of Rangoon: only an indication of what parasites were present was achieved. A much more thorough investigation is essential for the compilation of any complete list. Work is still in progress: the results will be published later.

The following must be regarded as only a provisional summary. The mouse was found to be almost completely immune, there being only one record of a parasite (*Moniliformis moniliformis*). Rats, on the other hand, showed a heavy infection, only 5 out of 50 being free. *Rattus rattus* was the least and *R. norvegicus* the most heavily parasitised; the infection of the former was almost entirely due to *Moniliformis moniliformis*. *Taenia taeniaeformis* was the commonest parasite, occurring in 20 out of the 50 rats examined, though relatively rare in *R. rattus*: this agrees with the heavy infection of the cat with the adult. Various species of *Raillietina* were the second most frequent parasite, though from *R. rattus* they were entirely absent. *Hymenolepis diminuta* and *H. nana* occur least often and were absent from *Nesocia bengalensis*. This is exactly opposite to the condition in England where the two species of *Hymenolepis* were extremely common, *Taenia taeniaeformis* rare and species of *Raillietina* entirely absent. Altogether *Taenia taeniaeformis* occurred 20 times, *Moniliformis moniliformis* 14, *Raillietina celebensis* 14, *R. funebris*, *R. celebensis paucicapsulata*, *R. fatalis* each 5, *Hymenolepis diminuta* and *H. nana* each 4, *R. indica*, and *R. fluxa*, each once and various species of nematodes 16. The following tables give the parasites found in each dissection.

TABLE 3.—Parasites of *Mus musculus*.

[illegible]

TABLE 4.—Parasites of *Nesocia bengalensis*.

No. of host	<i>Railietina celebensis multicap-sulata</i>	<i>R. celebensis paucicap-sulata</i>	<i>R. indica</i>	<i>R. funebris</i>	<i>R. fluxa</i>	<i>R. fatalis</i>	<i>Hymenolepis diminuta</i>	<i>H. nana</i>	<i>Taenia taeniae-formis (larval)</i>	<i>Moniliformis moniliformis</i>	Nematod ¹
14	..	..	+	..	..	..	..	..	..	..	..
15	+	..	..	..	..	..	..	..	+	..	+
25	+	+	..	..	..	..	..	..	..	+	..
29	+	..	..	+	..	..	..	..	..	..	+
31a	..	..	..	..	..	..	..	..	..	..	+
33	..	..	..	..	..	..	..	..	..	..	..
40	..	..	..	..	..	..	..	..	+	+	..
43	+	+	..	..	..	+	..	..	..	+	+
52	..	..	..	..	..	..	..	..	..	+	+
54	..	..	..	..	..	..	..	..	..	+	+
68	..	..	..	..	..	..	..	..	..	+	+
319	..	..	..	..	..	..	..	..	..	+	+
338	..	..	..	..	..	..	..	..	..	..	..
80	..	..	..	..	..	..	..	..	..	+	..
14	4	3	1	1	..	1	..	..	3	6	8

MEGGITT AND SUBRAMANIAN—TAPEWORMS OF MURINAE.

TABLE 1.—Parasites of *Rattus norvegicus*.

Number of host	<i>Railletina celebensis multicap-sutata</i>	<i>R. celebensis paucicap-sulata</i>	<i>R. indica</i>	<i>R. funebris</i>	<i>R. fluxa</i>	<i>R. fatalis</i>	<i>Hymenolepis diminuta</i>	<i>H. nana</i>	<i>Taenia taeniae-formis (larval)</i>	<i>Moniliformis moniliformis</i>	Nematoda
23	:	+	:	+	:	+	:	:	+	:	:
27	:	:	:	:	:	:	:	:	:	:	:
35	+	:	:	+	:	:	+	+	+	+	+
36	:	:	:	:	:	:	:	:	:	:	:
39	:	:	:	:	:	:	:	:	:	:	:
43	+	:	:	:	:	:	:	:	:	:	:
44	+	:	:	:	:	:	:	:	:	:	:
45	:	:	:	:	:	:	:	:	:	:	:
48	:	:	:	:	:	:	:	:	:	:	:
49	:	:	:	:	:	:	:	:	:	:	:
51	:	:	:	:	:	:	:	:	:	:	:
55	+	:	:	:	:	:	:	:	:	:	:
58	+	:	:	:	:	:	:	:	:	:	:
59	:	:	:	:	:	:	:	:	:	:	:
60	:	:	:	:	:	:	:	:	:	:	:
61	:	:	:	:	:	:	:	:	:	:	:
62	+	:	:	:	:	:	:	:	:	:	:
63	+	:	:	:	:	:	:	:	:	:	:
64	+	:	:	:	:	:	:	:	:	:	:
65	+	:	:	:	:	:	:	:	:	:	:
66	+	:	:	:	:	:	:	:	:	:	:
67	+	+	:	:	:	:	:	:	:	:	:
69	:	:	:	:	:	:	:	:	:	:	:
70	:	:	:	:	:	:	:	:	:	:	:
71	:	:	:	:	:	:	:	:	:	:	:
343	:	:	:	:	:	:	:	:	:	:	+
26	10	2	..	4	1	4	2	3	16	3	8

TABLE 2.—Parasites of *Rattus rattus*.

No. of host	<i>Raillietina celebensis multicap-sulata</i>	<i>R. celebensis paucicap-sulata</i>	<i>R. indica</i>	<i>R. funebris</i>	<i>R. fluxa</i>	<i>R. fatalis</i>	<i>Hymenolepis diminuta</i>	<i>H. nana</i>	<i>Taenia taeniae-formis (larval)</i>	<i>Moniliformis moniliformis</i>	Nematoda
16	+	..
21
32	+
37*	+	+	..
47	+	..
50	+	+	..
53
56	+
57	+
75
10	2	1	1	4	1

* Cestode fragments.

In conclusion, the authors wish to express their indebtedness to Dr. Homasjee and the official rat-catchers of the Rangoon Municipality for invaluable help in the supply of material.

SYSTEMATIC.

Order Cyclophyllidea Carus.

Diagnosis.—Cestoda : External segmentation complete and corresponding to internal. Suckers 4. Genital pore marginal (except Mesocestoidae) Vitelline gland compact, single (double in Mesocestoidae), posterior to ovary (anterior in Tetrabothriidae). Uterus without preformed pore, persistent or replaced by capsules or paruterine organs. Larval stage a solid parenchymatous mass with or without invaginated scolex, or a hollow sphere with or without a tail bearing the onchospheric hooks and with an invaginated scolex, or a bladder with several invaginated scoleces, or a bladder containing daughter bladders. Adults in mammals, birds, and reptiles : larval stages in mammals, reptiles, molluscs, and arthropods.

Family Anoplocephalidae Fuhrmann 1907.

Diagnosis.—Cyclophyllidea : Scolex unarmed, without rostellum. Proglottides usually broader than long. A single or double set of reproductive organs in each proglottis. Uterus persistent, of various types, or replaced by egg capsules, or by paruterine organ. Eggs with thin transparent envelopes. Adults in mammals, birds, and reptiles. Life-history unknown.

Type-genus — *Anoplocephala* E. Blanchard 1848.

Sub-family Linstowinae Fuhrmann 1907.

Diagnosis.—Anoplocephalidae : A single set of reproductive organs in each proglottis. Uterus breaks down into egg capsules. Adults in mammals and birds.

Type-genus.—*Linstowia* Zschokke 1898.

Inermicapsifer Janicki 1910.

Diagnosis.—Linstowinae : Genital pores unilateral. Genital ducts pass between longitudinal excretory vessels. Dorsal and ventral excretory plexi present. Testes numerous, extending lateral to excretory vessels. Ovary poral. Eggs in capsules. Adults in mammals.

Type-species.—*I. hyracis* (Rudolphi 1810).

‡ All measurements in mm. † original genus * larval stages.

I. aberratus Baer 1924.

Diagnosis.—Length 13, greatest breadth 0.6. Scolex 0.32 dia. Genital pore at centre of proglottis margin. Cirrus-sac 0.095×0.05 , (?) extending past excretory vessels. Testes 6-7, large, wholly aporal to female glands. Egg capsules 6, each containing 3-6 very large eggs.

Host.—*Mus moggi*.

Distribution.—Transvaal

Literature.—Baer 1924a, 244 : 1925d, 27 : 1927, 152.

I. arvicanthidis (Kofend 1917).

Synonymy.—

arvicanthidis Kofend 1917 : +*Anoplocephala*, *Inermicapsifer*.

Diagnosis.—Length 70-100, greatest breadth 2.0. Scolex 0.5 dia. Genital pore at centre of proglottis margin. Cirrus-sac 0.14-0.15 long, not extending to excretory vessels. Testes 30-50, scattered throughout the whole segment, extending externally to excretory vessel. Egg capsules 10-50, each containing 11-13 eggs.

Hosts.—*Arvicanthis testicularis kordofanensis*, *A. sp.*, *Golunda campanae*, *Mus moggi*, *Rattus rufinus*, rats houmba, timmun, tschakoja, tuglidaidi.

Distribution.—Belgian Congo, Dahomey, French Guinea, Kordofan, Transvaal.

Literature.—Baer 1925d, 27 : 1927, 153 : Joyeux & Baer 1927a, 30 : Joyeux & Mathais 1926, 334 : Kofend 1917 : 1921.

I. guineensis (Graham 1909).

Synonymy :—

gambianum Beddard 1911: *Inermicapsifer*, *Multicapsiferina*, +*Thysanotoma*, *Thysanotaenia*, *Zschokkeella*.

guineensis Graham 1908: +*Davainea*, *Inermicapsifer*, *Multicapsiferina*, *Zschokkeella*.

muricola Baylis 1915: *Multicapsiferina*, +*Zschokkeella*.

zanzibarensis Meggitt 1921: *Inermicapsifer*.

Diagnosis.—Length 90-150, greatest breadth 6.0. Scolex 9.6-0.75 dia. Genital pore in anterior portion of proglottis margin. Cirrus-sac $0.14-0.16 \times 0.04$, not extending to longitudinal nerve. Testes 70-130, scattered throughout the segment posterior to female glands and, aporally, anterior to them. Female glands poral. Egg capsules 30-130, each containing 7-12 eggs.

Hosts.—*Cricetomys gambianus*, *Mus* sp., *Rattus damarensis*, *R. norvegicus*, *R. rattus*.

Distribution.—Angola, Gold Coast, London (Zoo.), N. Africa, Sierra Leone, Zanzibar.

Literature.—Baer 1925d,33; 1927,154; Baylis 1915,40; Beddard 1911,1003; Graham 1909; Joyeux 1924,234; Joyeux and Mathais 1936,334; Meggitt 1921,193; Southwell 1921,168; Southwell and Adler 1924a,129.

Table of species of *Inermicapsifer*.

Species.	Extent of cirrus-sac.	No. of testes.	Arrangement of testes.	No. of egg capsules.	Eggs per egg capsule.
<i>I. aberratus</i> Baer 1924	Past excretory vessels.	6—7	Aporal to female glands.	6	3—6
<i>I. arvicanthidis</i> (Kofend 1917).	Not to excretory vessels.	30—50	Scattered throughout segment.	10—50	11—13
<i>I. guineensis</i> (Graham 1908).	Not to nerve..	70—130	Posterior and (aporally) anterior.	30—130	7—12

Family **Davaineidae** (Fuhrmann 1907.)

Diagnosis.—Scolex with simple rostellum, armed with one or more rows of very numerous hammer-shaped hooks. Eggs with thin transparent membranes.

Type-genus.—*Davainea* Blanchard 1891.

Sub-family **Davaineinae** (Bram 1900).

Diagnosis.—Davaineidae; Rostellum armed with 2-3 rows of hooks. Uterus breaks down into numerous egg capsules, each containing one or more eggs. Paruterine organ absent. Adults in mammals and birds.

Type-genus.—*Davainea* Blanchard 1891.

Railletina (Fuhrmann 1920).

Diagnosis.—Rostellum armed with a double row of hooks. Suckers armed or unarmed. Genital pores alternating or unilateral. Adults in mammals and birds, larval stages in insects.

Type-species.—*R. crassula* (Rudolphi 1819).

***R. baeri* n.sp.**

Synonymy.—

celebensis; *Raillietina* of Southwell, and Joyeux and Baer.

Diagnosis.—Scolex 0.275-0.65. Rostellar hooks 60-65, 0.012-0.016 long. In all other respects agreeing with *R. celebensis*.

Hosts.—*Rattus coucha*, *R. rattus*.

Distribution.—Accra, Dahomey, Tonkin.

Literature.—Joyeux and Baer 1927a, 34; Southwell 1921, 167.

***R. blanchard* (Parona 1898).**

Synonymy.—

blanchardi Parona 1898: †*Davainea*, *Raillietina*.

Diagnosis.—Length 72, greatest breadth 5. Rostellar hooks 70-80 (Parona) or 150 (Blanchard), 0.032 long, in two rows. Genital pore unilateral, in anterior half of proglottis margin. Eggs 0.016 dia., singly in capsules extending laterally to excretory vessels.

Host.—*Rattus rajah*, *R. sabanus*, *R. siporanus*.

Distribution.—Dahomey, Mentawai, Sarawak.

Literature.—Baylis 1926, 319; Blanchard 1898, 102; Joyeux and Baer 1927 a, 33; Parona 1898, 102.

***R. celebensis* (Janicki 1902).**

Synonymy.—

celebensis Janicki 1902: †*Davainea*, *Raillietina*.

Diagnosis.—Length 300, greatest breadth 1.15. Scolex 0.44-0.79 dia. Rostellum 0.13-0.18 dia, Rostellar hooks 100-130, 0.02-0.026 long. A spiny collar present posterior to rostellum. Acetabular hooks absent. Genital pore unilateral, very anterior, Cirrus-sac 0.113-0.146 (latter measurement only once) x 0.054-0.065 in mature segments, 0.106-0.13 x 0.048 in gravid, extending to nerve. Testes 9-15 poral, 17-23 aporal, total 26-36. Egg capsules 180-200, each containing 3-4 eggs, mostly within excretory vessels but a few lateral to them.

Host.—*Nesocia bengalensis*, *Rattus meyeri*.

Locality.—Rangoon, Celebes.

This species was originally described by Janicki (1902, 275) from *Rattus meyeri*, Celebes; unfortunately no scolex was seen by this

author. Southwell (1921,167) later described a cestode from *Rattus rattus*, Accra, under this name; a similar form was later found by Joyeux and Baer (1927,34) from *Rattus coucha*, Dahomey. The specimens found by the above investigators agree in all essentials with each other and with the incomplete description of Janicki but differ considerably from the Burmese forms. The following table shows the chief differences.

	Southwell	Joyeux	Present form
Dia. of scolex (in μ)	650	275	440
No. of rostellar hooks	60	60-65	120-130
Size of rostellar hooks (in μ)	12	12	21-26

While the internal anatomy of all three forms is similar, the characters of the scolex are not. The specimens of the other two investigators are from Africa and are therefore less likely than the present form to be the same species as those of Janicki; for this reason, the Burmese cestodes are listed as *R. celebensis* and the others placed in a new species *R. baeri*.

R. celebensis paucicapsulate n. var.

Diagnosis.—Length 242, greatest breadth 1.04. Scolex 1.04-0.56 dia. Rostellum 0.14-0.17 dia. Rostellar hooks 100-120, 0.02-0.025 long. A spiny collar present posterior to rostellum. Acetabular hooks absent. Genital pore unilateral, slightly anterior to centre of proglottis margin. Cirrus-sac 0.089-0.113 x 0.048-0.065 in mature segments, 0.09-0.121 x 0.04-0.048 in gravid; extending to nerve. Testes 11-15 poral, 20-23 aporal, total 33-35. Egg capsules 100-120, each containing 3-4 eggs, mostly within excretory vessels but a few lateral to them. The present form agrees closely with the preceeding except for the gravid proglottides. In that latter respect the two forms are clearly different; this though is not of sufficient importance to justify the creation of a new species.

Host.—*Rattus norvegicus*, *Nesocia bengalensis*.

Distribution.—Rangoon.

R. fatalis n. sp.

Diagnosis.—Length 186, greatest breadth 4.5. Scolex 0.36-0.6 dia. Rostellum 0.14-0.17 dia. Rostellar hooks 180, 0.023-0.032 long. in two rows. A spiny collar present posterior to rostellum. Acetabular hooks in 6 rows. 0.004 long. All proglottides broader than long. Ventral excretory plexus present, with 3-4 longitudinal vessels. Cirrus-sac 0.105 x 0.07. in mature segments, not reaching nerve.

Testle 15-26 aporal, 13-22 poral, total 38-43, mostly between the two outermost longitudinal excretory vessels. Gravid proglottides narrower than those more anterior but relatively longer; strobilus therefore pointed posteriorly. Eggs singly in 'small egg capsules, too numerous to count, tightly packed together, extending laterally to excretory vessels and nerve, giving rise to a granular appearance in whole mounts.

Host.—*Nesocia bengalensis*, *Rattus norvegicus*.

Distribution.—Rangoon.

***R. fluxa* n. sp.**

Diagnosis.—Length 13, greatest breadth 1.0. Scolex 0.626 dia. Rostellum 0.195 dia. Rostellar hooks 156, 0.018-0.022 long. Posterior to rostellum a spiny collar present. Acetabular hooks absent. Testes 12-14 aporal, 7 poral. Genital pores irregularly alternate.

Hosts.—*Rattus norvegicus*.

Locality.—Rangoon.

***R. funebris* n. sp.**

Diagnosis.—Length 32, greatest breadth 0.76. Scolex 0.41-0.58 dia. Rostellum 0.105-0.171 dia. Rostellar hooks 80-100, 0.017-0.021 long. A spiny collar present posterior to rostellum. Acetabular hooks absent. Genital pore unilateral, at anterior third of proglottis margin. Cirrus-sac 0.105-0.121 x 0.048-0.054, extending to excretory vessels in mature segments but only just past nerve in young ones. Testes 35-40, surrounding female glands on all sides except immediately dorsally and the space for the genital ducts. Gravid segments absent.

The most closely allied species are *R. gracilis* (Janicki 1904) and *R. madagascariensis* (Davaine 1869), both of which have acetabular hooks: careful examination of the above specimens has failed to reveal any trace of hooks on the suckers. The testes in *R. madagascariensis* number 50: in *R. gracilis* the genital pore is only slightly anterior. These differences, in spite of the deciduous nature of acetabular hooks, are sufficient to justify the creation of a new species. It should be mentioned that Janicki also failed to find gravid segments in *R. gracilis*.

Host.—*Rattus norvegicus*.

Locality.—Rangoon.

***R. gracilis* (Janicki 1904)**

Synonymy.—

gracilis Janicki 1904: ‡ *Davainea*, *Raillietina*

Diagnosis.—Length 25, greatest breadth 0.7. Scolex 0.27 dia. Rostellar hooks 120, size ?. Suckers armed. Genital pore unilateral, slightly anterior. Cirrus-sac 0.107 long, extending to excretory vessel. Testes 35-40, entirely surrounding female glands except for genital ducts. Gravid segments absent.

Host.—*Mus flavidus*.

Locality.—El Tor

Literature.—Janicki 1906, 570

***R. indica* n. sp.**

Diagnosis.—A single immature specimen. Scolex 0.82 dia. Rostellum 0.24 dia. Rostellar hooks 250-260, 0.022—0.025 long. A spiny collar present posterior to rostellum. Acetabular hooks 0.002-0.003 long, in 6-7 rows, diminishing in size internally. Proglottides absent. The advisability of founding a new species upon a single immature specimen is exceedingly dubious. In the present case the differences do not permit of any other course.

Host.—*Nesocia bengalensis*.

Locality.—Rangoon.

***R. kordofanensis* n. sp.**

Synonymy.—

trapezoides: *Davainea* of Kofend 1921.

Diagnosis.—Length 40-100, greatest breadth 1.0. Scolex small. Rostellar hooks 0.067 long. Suckers armed. Cirrus-sac 0.14 long, oblique, extending to excretory vessels. Testes 10-12, lateral and posterior to female glands. Ovary oblique to transverse axis of proglottis. Vitelline gland elongated longitudinally. Egg capsules each contain 4-5 eggs. This species was originally described as *R. trapezoides* but as that species has rostellar hooks 0.008 long the identification is obviously incorrect. Presumably the anatomy of the two forms agrees except for the difference just mentioned.

Host.—*Arvicanthus testicularis kordofanensis*

Locality.—Kordofan.

Literature.—Kofend 1921.

***R. polycalceola* (Janicki 1902)**

Synonymy.—

polycalceola Janicki 1902 : † *Davainea*, *Davainoides*, *Railletina*

Diagnosis.—Length 90, greatest breadth 3.53. Scolex 0.44 dia. Rostellar hooks 160, 0.02 long, in a double circle of 0.17 dia. Posterior to rostellum a collar of fine spines. Suckers armed with numerous hooks, 0.004 long. All proglottides broader than long. Excretory system with three lateral longitudinal vessels on each side. Genital pore irregularly alternates, anterior to centre of proglottis margin. Cirrus-sac 0.113 by 0.059, not extending to nerve: cirrus unarmed. Testes 90, lateral to female glands and may extend externally to excretory vessels. Eggs singly in capsules, approximately 1,000 in each proglottis.

The genus *Davainoides* was created by Fuhrmann (1921, 16) for *Davainea vigintivasus* Skrjabin 1914 and *D. polycalceola* Janicki 1902 "qui se distinguent de tous les *Davainea* par le structure de leur système excréteur. En effet ces deux formes présentent à la place de 4 vaisseaux excréteurs, l'un 20, l'autre 6 vaisseaux longitudinaux. Les deux formes ont des strobila relativement très larges et les proglottis très courts à l'exception des proglottis mûrs. Ils montrent des pores sexuelles irrégulièrement alternans et possèdent un nombre de testicules très considérable (150 et 90). Les onchosphères sont isolées dans les capsules utérines. Tous ces caractères à l'exception de la position des pores sexuels et de la disposition des onchosphères sont exceptionnels pour les *Davainea*: c'est pour cette raison que nous proposons de créer pour ces 2 espèces un nouveau genre." As above stated, the position of the genital pores and the disposition of the eggs is shared by others of the former genus *Davainea*. *D. campanulata* Fuhrmann 1908 and *D. paradisea* Fuhrmann 1908 each have 100 testes, *D. leptacantha* Fuhrmann 1908 and *D. parva* Janicki 1904 each 80. The only characters therefore distinguishing the genus are the relative shortness of the proglottides and the number of longitudinal excretory vessels. Apart from the variability of the excretory system (*e.g.*, Rudin 1917, 317) these characters are not of generic value: *Davainoides* should fall into synonymy with *Raillietina*.

Host.—*Arvicanthis abyssinicus*, *Acomys muschenbrochi*

Locality.—Celebes, East Africa.

Literature.—Janicki 1902, 258; Parona 1909, 2.

R. retractilis (Stiles 1895)

Synonymy—

retractilis Stiles 1895; † *Davainea*, *Raillietina*.

Diagnosis. Length 105, greatest breadth 3. Scolex 0.37-0.68 dia. Rostellum 0.08 by 0.048. Rostellar hooks 90-120, 0.012 long. Suckers armed with 500-700 hooks and can be completely retracted within scolex. Genital pore unilateral, at centre of proglottis margin. Cirrus-sac 0.12 by 0.06, not reaching excretory vessel. Testes numerous, in two groups, one each side median line. Eggs 0.08 dia., singly in capsules extending laterally to excretory vessels.

Host.—*Rattus rattus*.

Locality.—Dahomey.

Literature.—Joyeux and Baer 1927a, 34; Stiles 1896, 195.

***R. trapezoides* (Janicki 1904)**

Synonymy.—

trapezoides Janicki 1904: + *Davainea*, *Raillietina*.

Diagnosis.—Length 40, greatest breadth 1·0. Scolex 0·067-0·182 dia. Rostellar hooks 160, 0·008 long, in a single row. Suckers armed. Genital pore unilateral, approximately at centre of proglottis margin. Cirrus-sac 0·105-0·132 by 0·052-0·075, extending to excretory vessels. Testes 12-15, entirely surrounding female glands except for space required for genital ducts. Ovary bilobed, each lobe subdivided into five, obliquely to transverse axis of proglottis. Egg capsules 40-50; each containing 4-5 eggs, in a double layer, (?) not extending laterally to excretory vessels.

Host.—*Arvicanthis niloticus*, *A. pumilis bechuanae*, *Mus. sp.*

Locality.—Egypt, Kalahari.

Literature.—Janicki 1906, 568; Hungerbühler 1910, 516.

***R. sp.* (Johnston 1918)**

Synonymy.— *sp*: *Davainea*

Diagnosis.—None given.

Host.—*Rattus norvegicus*.

Locality.—Brisbane.

Literature. Johnston 1918, 56.

Table of species of *Raillietina*.

Species.	No. of rostellar hooks.	Size of rostellar hooks (in μ).	Acetu- bular hooks.	Position of genital pore.	Extent of cirrus-sac.	No. of testes.	No. of egg capsules.	Extent of egg capsules.	No. of eggs per capsule.
<i>R. baeri</i> n. sp.	60-65	12-16	—	Unilateral, very anterior	To nerve ..	26-36	180-200	Mostly within excretory vessels.	3-4
<i>R. blanchardi</i> (Parona 1898)	70-80 or 150	32	—	Unilateral, anterior.	..	..	..	Extending late- rally to excre- tory vessels.	1
<i>R. celebensis</i> (Janicki 1902) ..	100-130	20-26	—	Unilateral, very anterior	To nerve ..	26-36	180-200	Mostly within excretory vessels.	3-4
<i>R. celebensis paucicapsulata</i> n. var.	100-130	20-26	—	Unilateral, very anterior	To nerve ..	26-36	100-120	Mostly within excretory vessels.	3-4
<i>R. fatalis</i> n. sp.	180	23-32	+	Alternates, very anterior	Not to nerve	38-43	Two num- erous to count.	Extending late- rally to excre- tory vessels and nerve.	1
<i>R. fluxa</i> n. sp.	156	18-22	—	Alternates ..	..	19-21	..	..	..
<i>R. funebris</i> n. sp.	80-100	17-21	—	Unilateral, anterior.	To excretory vessels.	35-4	..	..	..
<i>R. gracilis</i> (Janicki 1904) ..	120	..	+	Unilateral, anterior.	To excretory vessels.	35-40	..	..	..
<i>R. indica</i> n. sp.	250-260	22-25	+	..	To excretory vessels.	10-12	..	..	4-5
<i>R. kordofanensis</i> n. sp.	..	67	+	? Unilateral	..	..	..	..	..
<i>R. polycycaea</i> (Janicki 1902)	160	20	+	Alternates, anterior.	Not to nerve	90	1,000	..	1
<i>R. retractilis</i> (Stiles 1895) ..	90-120	12	+	Unilateral central.	Not to excre- tory vessels.	Num- erous.	..	Extending late- rally to excre- tory vessels.	1
<i>R. trapezoides</i> (Janicki 1904)	160	8	+	Unilat. ral, central.	To excretory vessels.	12-15	40-50	Within excre- tory vessels.	4-5
<i>R. sp.</i> (Johnston 1918) ..	..	..	..	...	..	..	..	..	..

Family **Hymenolepididae** Railliet and Henry 1909.

Diagnosis:—Scolex with or without armed or unarmed rostellum. Rostellar hooks not T-shaped. A pseudoscolex may be present. Suckers usually unarmed. A single or double set of reproductive organs in each proglottis. Testes, when numerous, always extending posteriorly to female glands (except *Proorchida*). Uterus may be continuous throughout strobilus. Eggs with thin transparent membranes. Adults in mammals, birds, reptiles, amphibia and fish: larval stages, where known, in mammals Reptilia, Insecta, and Oligochaeta.

Type-genus—*Hymenolepis* Weinland 1850.

Sub-family **Dilepiinae** Stiles 1896.

Diagnosis:—Hymenolepididae: Rostellum armed a double or single row of hooks, or unarmed in one genus. Genital pores usually pass between longitudinal excretory vessels. Testes numerous. Uterus sac-like, occasionally ring-like, or divided by septae, never replaced by egg capsules.

Type-genus.—*Anomotaenia* Cohn 1900.

Chitinolepis Baylis 1926.

Diagnosis.—Dilepiinae: Scolex unarmed. Genital pore unilateral. Genital ducts pass dorsally to excretory vessels and nerve. Cirrus-sac small. Testes few, in two lines, one each side female glands. Uterus sac-like. Adults in rodents.

Type-species.—*C. mjobergi* Baylis 1926.

This genus was originally placed in the Hymenolepinae: its affinities are rather with the Dilepiinae. The character distinguishing the Hymenolepinne from the Dilepiinae is the small number of testes, not exceeding four. Admit *Chitinolepis* to the former sub-family and the distinction between the two disappears.

C. mjobergi (Baylis 1926.)

Diagnosis.—Length 130-170, greatest breadth 2.5. Scolex 0.34-0.43 dia. Rostellum present but unarmed. Cirrus sac 0.34-0.37 by 0.4-0.06, extending just past nerve. External vesicula seminalis present. Cirrus armed. Testes 9-12. Vagina opens ventral to cirrus-sac. Ovary deeply lobed. Eggs 0.065 dia.

Host.—*Rattus sabanus*.

Locality.—Sarawak.

Literature.—Baylis 1926b, 315.

Choanotaenia Railliet 1896.

Diagnosis.—Dilepiinae: Rostellum with a single crown of hooks. Genital pores irregularly alternate. Genital ducts pass between excretory vessels. Testes numerous, posterior. Uterus sac-like, often much subdivided by internal septae. Adults in mammals and birds.

Type-species.—*C. infundibuliformis* (Goeze 1782)

C. sp. (Joyeux & Baer 1927)

Synonymy.—

Icterotaenia sp. Joyeux and Baer 1927

Diagnosis.—No description given except that the rostellar hooks had been lost. From this may be deduced the presence of a rostellum, in which case the form is probably a *Choanotaenia*: should it be absent the form is more probably a *Catenotaenia*.

Host —Rat.

Locality.—French Guinea.

Literature.—Joyeux and Baer 1927a, 35.

Sub-family **Dipylinae** Stiles 1896.

Diagnosis.—Rostellum armed (except in *Panderina* and *Eugonodaeum*). Suckers unarmed. A single or double set of reproductive organs in each proglottis. Uterus sac-like, simple or lobed, breaking down into numerous egg capsules, each containing one or several eggs. Parauterine organs absent. Adults in mammals, birds, and fish: larval stages in reptiles and insects.

Type-genus.—*Dipylidium* Leuckart 1863.

The chief difference between this and the Listowinae is the possession or absence of an armed rostellum, a character of no more than generic importance. *Anoploetaenia* (unarmed) and *Taenia* (armed) both belong to the Taeniidae: in the Paruterininae five genera have unarmed and four armed scoleces: while in *Hymenolepis* both armed and unarmed forms are included. Baer (1925c, 8) states "To our mind the presence of an unarmed scolex is not necessarily a reason for including this genus in the Anoplocephalidae". The distinction between the two sub-families must therefore be of a different nature. While the testes, shape of segments, and arrangements of genitalia in *Inermicapsifer* are of the *Anoplocephala* type, the corresponding structures in *Oochoristica* are as distinctly of the *Monopylidium*. In *Oochoristica* the eggs in gravid segments are scattered throughout the parenchyma, a definite wall to the capsules—if present—is thin and inconspicuous: in the remaining genera of the Listowinae the eggs are enclosed in very definite egg capsules with thick deeply staining walls. The first condition approximates more closely to that in such a genus as *Dipylidium* than to the corresponding structures in *Inermicapsifer*.

These distinctions should be made to separate the two sub-families, the genera of the latter type (*Oochoristica*, *Palaia*) being removed to the Dipylinae, which already includes two genera with unarmed scolices.

Oochoristica Lühe 1899.

Diagnosis.—Dipylinae: Scolex without rostellum or acetabular hooks. Genital pores irregularly alternate. Genital ducts pass between or dorsal to excretory vessels. Testes numerous, usually posterior to but may also be lateral to female glands. Uterus breaks down early, the eggs becoming enclosed singly in egg capsules. Adults in mammals and reptiles: larval stage unknown.

Type-species.—*O. tuberculata* (Rudolphi 1819).

O. symmetrica (Baylis 1927).

Synonymy.:—

symmetrica Baylis 1927: *Catenotaenia*.

Diagnosis:—Length over 130, greatest breadth 2.0. Scolex 0.42 dia. Ventral excretory vessel forming a ventral plexus. Genital pore nearly at anterior extremity of proglottis margin. Cirrus-sac 0.125 x 0.065. Testes 50-76, in a single layer. Ovary median, bilobed, aporal lobe larger than poral, both deeply indented. Vitelline gland posterior to ovary, median, lobed. Receptaculum seminis between ovary and vitelline gland. Uterus, if present, very ephemeral, eggs early scattered throughout proglottis. Outer egg shell 0.06-0.0625 x 0.0525-0.055.

This species was placed in the genus *Catenotaenia* by the proposer. That genus has a very definite uterus with lateral diverticulae, and therefore cannot contain the present form. In all respects the species agrees with *Oochoristica*. The only other species of this genus from rodents is *O. sp.*, recorded by Douthitt (1915,62) from *Geomys bursarius*, U.S.A.

Hosts.:—*Rattus rattus*.

Locality.:—England.

Literature.:—Baylis 1927b, 436.

Sub-family **Hymenolepidinae** Ransom 1909.

Diagnosis.—Rostellum armed with a single crown of hooks, more rarely with a double or unarmed or rudimentary. Segments usually broader than long. A single set of reproductive organs in each proglottis. Genital pores unilateral. Genital canals pass dorsally to excretory vessels and nerve. Testes usually 1-4, occasionally more numerous. Vas deferens short, with external vesicula seminalis. Uterus persistent, sac-like. Eggs with three transparent envelopes. Adults in mammals and birds: larval stage in mammals and insects.

* *Type genus*.—*Hymenolepis* Weinland 1858.

Hymenolepis Weinland 1858.

Diagnosis.—Hymenolepidinae: Rostellum armed with a single or double crown of hooks, rarely rudimentary and unarmed. Suckers occasionally (*i.e.* unarmed. Testes three in each segment. Vas deferens with internal inside cirrus-sac) and external (*i.e.* outside cirrus-sac) vesiculae seminales. Adults in mammals and birds.

Type-species.—*H. diminuta* (Rudolphi 1819)

H. contracta Janicki 1904. ✓

Diagnosis.—Length 25, greatest breadth 1.9. Scolex 0.27-0.22 dia. Rostellar hooks 28, size (?). [Genital pore at centre of proglottis margin]. Cirrus-sac 0.13 long, [extending to excretory vessels. Testes one poral, two aporal: of the latter, one anterior and internal to the other] Egg shell 0.069 dia, similar to that of *H. diminuta*. Janicki (1906, 574) states "Die Geschlechtsorganen nähern sich dem bei *H. procera* dargestellten Typus". The parts in brackets of the above description are taken from the figures given.

Host.—*Mus musculus*, *Rattus norvegicus*.

Locality.—Germany.

Literature.—Janicki 1906, 574.

H. diminuta (Rudolphi 1819).

Synonymy.—

leptocephala Lussano and Romaro: *Taenia*.

diminuta Rudolphi 1819, †*Hymenolepis*, *Taenia*.

crassa Janicki 1904: *Hymenolepis*.

diminutoides Cholodkovsky 1912: *Hymenolepis*.

flavomaculata Leuckart 1863: *Taenia*.

flavopunctata Weinland 1858: †*Hymenolepis*, *Lepidotrias*, *Taenia*.

hymenolepis-diminutae Railliet 1892: *Cysticercus*.

leptocephala Creplin 1825: *Taenia*.

? *megaloon* Linstow 1901: *Hymenolepis*, †*Taenia*.

minima Grassi 1886: *Taenia*.

? *relicta* Zschokke 1887: *Hymenolepis*, †*Taenia*.

taeniae-diminutae: *Cysticercus*.

varesina E. Parona 1884: *Taenia*.

sp. Janicki 1904; *Hymenolepis*.

Diagnosis.—Length 200-600, greatest breadth 2.5-4.0. Scolex 0.25-0.5 dia. Rostellum present but without hooks. Genital pore at anterior third of proglottis margin. Cirrus-sac 0.17-0.3 x 0.02-0.03 in mature segments, 0.24-0.4 x 0.04-0.6 in gravid, extending to or just past excretory vessels. Testes normally in the same straight line, with a poral separated from the two aporal by the ovary, but extraordinarily variable in arrangement. Outer egg-shell 0.54-0.86 dia. Adults in Primates and Rodentia: larval stages in Coleoptera and Siphonaptera.

Host (Murinae only).—*Apodemus sylvaticus* *Arvicanthis barbatus pulchellus*, *Mus musculus*, *Rattus norvegicus*, *R. rattus*, *R. rattus alexandrinus*, *R. terrae-reginae*.

Locality.—Cosmopolitan.

Literature.—Chandler 1927d, 973: Baer 1927, 35: Gedoelst 1925, 1429: Grassi & Rovelli 1889, 372: Joyeux 1916: 1920: Joyeux and Mathais 1926, 334: Leidy 1904, 181: Lühe 1910, 87: Minchin and Nicoll, 1911, 9: Podiapolsky 1924, 12: Ransom 1904, 13 and 79: Smith 1908, 264: Zschokke 1889, 64.

The species *H. megaloon* (Linstow 1901) and *H. relictæ* (Zschokke 1887) are considered as synonyms of *H. diminuta*. Of the first Ransom (1904, 84) states it "resembles *H. diminuta* except in one or two minor details and is a very nearly related species": the second "is so nearly like *H. diminuta* that it is a question whether the two ought to be united in one species, *H. diminuta*. Practically the only distinguishing characteristics seem to be differences in the length and number of segments, upon the basis of which it would be a very difficult matter to draw a line separating the two forms". In his key to the species of *Hymenolepis*, Lühe (1910, 66) distinguishes

"Proglottiden 10-20 mal so breit wie lang. *H. diminuta*

Proglottiden 40-80 mal so breit wie lang. *H. relictæ*".

a very slight character. *H. relictæ* is from the same host as *H. diminuta*, *H. megaloon* from a different rodent. In the absence of any distinguishing characters the species should be suppressed and considered as synonyms of *H. diminuta*. The differences between *H. diminuta*, *H. crassa* Janicki 1904, and *H. sp.* Janicki 1904 mentioned by Janicki (1906, 72 & 74) are inadmissible, being such as may be produced by growth or muscular contraction: the last two species are therefore considered as synonyms of the first.

H. globirostris Baer 1925.

Diagnosis.—Length 80, greatest breadth 0.5. Scolex 0.48 dia. Rostellum 0.13 dia. Rostellar hooks 12-14, 0.024 long. Cirrus-sac 0.26 x 0.06, extending to excretory vessels: cirrus unarmed. Testes posterior to ovary, in the same straight line. Eggs 0.03 dia.

Host.—Rat "houmba".

Locality.—Belgian Congo.

Literature.—Baer 1925f, 243.

H. horrida (Linstow 1900).

Synonymy.—

horrida Linstow 1900 : *Taenia*.

Diagnosis.—Length 80, greatest breadth 2·0. Scolex 0·25 dia. Rostellum absent. Cirrus-sac small. Ovary bilobed, each lobe only slightly subdivided. Outer egg-shell 0·068 x 0·034. Inner egg-shell with pointed, hook-shaped prolongations at both poles.

Host.—*Rattus norvegicus*.

Locality.—Germany, Russia.

Literature.—Linstow 1901, 1 : Lühe 1910, 89 : Podiapolsky 1924, 6.

H. microstoma (Dujardin 1845)

Synonymy.—

brachydera Diesing 1854 : *Taenia*.

microstoma Dujardin 1845 : *Hymenolepis*, + *Taenia*.

muris-decumani Diesing 1863 : *Taenia*.

taeniae-microstomae : *Cysticercus*.

tenebrionis Villot 1882 : † *Cercocystis*, *Cysticercus*, *Cysticercoides*.

Diagnosis.—Length 162, greatest breadth 2·1. Scolex 0·45 dia. Rostellar hooks 30, 0·011 long. Egg 0·082-0·09.

Host.—*Mus musculus*, *Rattus norvegicus*, *R. rattus*.

Locality.—France, Germany, S. Oran.

Literature.—Blanchard 1891, 52 : Dujardin 1845, 565 : Joyeux and Kobozeff 1927, 13 : Lühe 1910, 86.

H. muris-variegatus Janicki 1904.

Diagnosis.—Length 5-6, greatest breadth 0·34. Scolex 0·47 dia. Rostellar hooks 20, 0·105 long. Genital pore at centre of proglottis margin. Cirrus-sac 0·09 long, extending nearly half-way across segment. Testes all three in the same straight line. Eggs 0·027 dia.

Host.—*Arvicanthus nilotica*, *A. variegatus*.

Locality.—Egypt, S. Africa.

Literature.—Baer 1925, 45 ; Janicki 1906, 567.

H. nana (Siebold 1852).*Synonymy.* -*aegyptica* Bilharz 1852 : *Taenia*.*fraterna* Stiles 1906 : *Hymenolepis*.*inexpectata* Cholodkovsky 1912 : *Hymenolepis*.*hymenolepis murinae* Brumpt 1919 : *Cercocystis*.*hymenolepis-nanae* : *Cysticercus*.*longior* Baylis 1922 : *Hymenolepis*.*murina* Dujardin 1845 : *Hymenolepis*, *Lepidotrias*, †*Taenia*.*nana* Siebold 1852 : *Diplacanthus*, *Hymenolepis*, †*Taenia*.*nana fraterna* Stiles 1906 : *Hymenolepis*.*taeniae-nanae* : *Cysticercus*.*taeniae-murinae* : *Cysticercus*.

Diagnosis.—Length 5-40, greatest breadth 0.5-0.9. Scolex 0.21-0.48 dia. Rostellar hooks 20-30, 0.014—0.018 long. Genital pore slightly anterior. Cirrus-sac small, not reaching excretory vessels. Testes in the same straight line but liable to variation. Outer egg-shell 0.03-0.06 dia. Adults in man and rodents, larvae in insects.

The description of *H. inexpectata* is here inaccessible, but Baylis (1922, 8) states "The description of *H. inexpectata* is very brief and scarcely suffices to determine whether this species is distinct from that described by the writer as *H. longior*. The number and size of the hooks, the size of the suckers and the arrangement of the testes, as described, indicate differences which may be of specific importance, but the other differences are such as are to be accounted for by a greater degree of muscular contraction, and it is impossible to lay any stress upon them." The number and size of hooks fall within the limits given for *H. nana*, the size of the suckers is too liable to be affected by muscular contraction to be of much importance. The arrangement of the testes may suffice to distinguish this species, but it should be emphasised that in *H. nana* this is liable to variation. The species therefore is here considered as a dubious synonym of *H. nana*.

Host (Murinae only).—*Arvicanthis abyssinicus*, *Apodemus sylvaticus*, *Micromys agrarius*, *M. minutus*, *Mus musculus*, *M. musculus wagneri*, *M. sp.*, *Rattus nowegicus*, *R. rattus*, *R. rattus alexandrinus*.

Locality.—Cosmopolitan.

Literature.—Baylis 1922, 2 : 1924, 415 : Blanchard 1891a, 7 : Dampf 1910, 452 : Grassi and Rovelli 1892a : Joyeux 1919, 228 : 1925, 270 : Lühe 1910, 86 : Minchin and Nicoll 1911, 11 : Ransom 1904, 14 : 1920, 188 : Scott 1923, 194 : Saheki 1925, 305 : Woodland 1924d, 69 : 1924b, 428 : 1923b, 436.

H. sp. Baylis 1926.*Diagnosis*.—Not given.*Host*.—*Apodemus sylvaticus*.*Locality*.—England.*Literature*.—Baylis 1926a.*H. sp.* Leon 1908.*Diagnosis*.—Not given.*Host*.—Mouse.*Locality*.—Roumania.*Literature*.—Leon 1908,Table of species of *Hymenolepis*.

Species.	No. of rostellar hooks.	Size of rostellar hooks (in μ).	Position of genital pore.	Extent of cirrus-sac.	Arrangement of testes.	Dia. of egg (in μ).	Egg filaments
<i>H. contracta</i> Janicki 1904.	28	?	Central ..	To excretory vessels.	Central testis anterior to the others.	69	—
<i>H. diminuta</i> (Rudolphi 1819).	0	0	Anterior ..	To or just past excretory vessels.	In the same straight line, but variable.	..	—
<i>H. globirostris</i> Baer 1925.	12—14	24	Slightly anterior.	To excretory vessels.	In the same straight line.	30	—
<i>H. horrida</i> (Linstow 1900).	0	0	—	—	—	34 × 68	+
<i>H. microstoma</i> (Dujardin 1845).	30	11	—	—	—	82—90	—
<i>H. muris-variegatus</i> Janicki 1904.	20	105	Central ..	Half way across segment.	In the same straight line.	27	—
<i>H. nana</i> (Siebold 1852).	20—30	14—18	Slightly anterior.	Not to excretory vessels.	In the same straight line.	36—56	—
<i>H. sp.</i> (Batlis 1926).	—	—	—	—	—	—	—
<i>H. sp.</i> Leon (1908).	—	—	—	—	—	—	—

Family *Mesocestoididae* Fuhrmann 1907.

Diagnosis.—Scolex without rostellum or hooks. Suckers unarmed. A single set of reproductive organs in each segment. Genital pores on ventral surface of proglottis, median. Vagina opens anterior to or besides cirrus-sac. Vitelline gland double. Eggs in gravid segments enclosed in a single thick-walled capsule. Adults in mammals and birds.

Type-genus.—*Mesocestoides* Vaillant 1863.

***Mesocestoides* Vaillant 1863.**

Diagnosis.—With the characters of the family.

Type-species.—*M. ambiguus* Vaillant 1863.

***M. lineatus* (Goeze 1782).**

Synonymy.—

canis-lagopodis Rudolphi 1810 : *Mesocestoides*, *Ptychopysa*, + *Taenia*
cateniformis Goeze 1782 e. p. : *Taenia*.

cateniformis-literatus Batsch 1786 : *Taenia*.

corti Hœppli 1925 : *Mesocestoides*.

lineata Goeze 1782 : *Halysis*, *Mesocestoides*, *Ptychopysa*, + *Taenia*.

litterata Batsch 1786 : *Alyselminthus*, *Halysis*, *Mesocestoides*, *Ptychopysa*, + *Taenia*.

lagopodis Leuckart 1879 : *Taenia*.

pseudo-cucumerina Railliet 1893 : *Taenia*.

pseudo-elliptica Railliet 1893 : *Taenia*.

serrata astephana Diesing 1863 : *Taenia*.

utriculifera Walter 1866 : *Mesocestoides*, *Monodoridaum*, + *Taenia*.

vulpina Schrank 1788 e. p. : *Taenia*.

sp. Podiapolsky 1924 : *Dithyridium*.

Diagnosis.—Length 300-2500, greatest breadth 3. Scolex 0.6-0.9 dia. Testes 50, median and lateral to excretory vessels. Cirrus-sac anterior ; cirrus unarmed. Uterus concave antero-posteriorly, with posterior dilatation which later is transformed into an egg capsule ; remains of uterus attached to capsule as two cords. Egg 0.04-0.6 x 0.035-0.043.

Host—(adult) Carnivores.
(larval, Murinae only) *Mus musculus*, *Rattus norvegicus*.

Locality.—France, Germany, Iceland, Italy, Russia, Roumania, S. Africa, U.S.A., Poland.

Literature.—Cameron 1925, 43 : Hall 1919, 59 : Hamann 1885, 759 : Hœppli 1925, 91.

***Dithyridium* Rudolphi 1819.**

Diagnosis.—Mesocestoidae : Adult stage unknown, probably *Mesocestoides*. Larval stage with invaginated scolex provided with four suckers

Rostellum and hooks absent. Body containing a very small cavity and but little fluid?. In mammals, birds and reptiles.

Type-genus.—A collective group and not needed.

D. elongatum Blumberg 1882.

Synonymy.—

baillieti Railliet 1885 : †*Cysticercus*, *Dithyridium*, *Plerocercoides*.
elongatum Blumenberg 1882 : †*Cysticercus*, *Dithyridium*, *Piestocystis*.

Diagnosis.—Length 15-50, greatest breadth 1-2.

Host (Murinae only).—*Rattus norvegicus*—pleural or peritoneal cavity.

Locality.—Austria, France, Germany, Poland, Russia, U. S. A

Literature.—Neveu-Lemaire 1912, 570 : Railliet 1893, 314.

* **D. spp.** Skrjabin and Schulz 1926.

Diagnosis.—Length 1.76-5.62. Scolex 0.476—0.544. This species is stated by the authors above mentioned to be the larval stage of *Mesocystoides lineatus* on the basis of the agreement in size and shape of the scoleces. In view of the fact that the scolex is liable to alter considerably in size and shape, that it is virtually impossible to identify a species by an unarmed scolex, and that no feeding experiments were undertaken, it appears best, while admitting the plausibility of the hypothesis, to await further confirmation.

Host.—*Mus musculus*, *Rattus norvegicus*.

Locality.—Russia.

Literature.—Skrjabin and Schulz 1926, 68

Family **Taeniidae** Ludwig 1886

Diagnosis.—Rostellum usually well developed, rarely rudimentary, and usually armed with a double circle of hooks composed of a circlet of large hooks and a circlet of small, the large and small arranged alternately : rarely with a single circlet of unarmed. Suckers unarmed. Gravid proglottides longer than broad. A single set of reproductive organs in each proglottis. Genital pores alternate. Testes numerous. Ovary bilobed, usually posterior to testes. Uterus with a median stem and lateral branches. Eggs usually with a thick, radially striated inner envelope. Adults in mammals and birds.

Type-genus.—*Taenia* Linnaeus 1758.

Catenotaenia Janicki 1904.

Diagnosis.—Taeniidae : Scolex unarmed, without rostellum. Genital ducts pass dorsally to longitudinal excretory vessels. Testes numerous, posterior to female glands. Inner egg membrane thick, but not radially striated. Adults in mammals.

Type-species.—*C. pusilla* Janicki 1904.

C. lobata Baer 1925.

Diagnosis.—Length 144, greatest breadth 2.5. Scolex 0.7 dia. Suckers on small projections. Ventral excretory vessel forming a plexus. Genital pore nearly at anterior border of segment. Cirrus-sac 0.15 x 0.06, from figure not reaching excretory vessel. Testes 200, in 2-3 layers. Ovary aporal, much and deeply lobed, extending nearly whole length of proglottis. Vitelline gland poral, lateral to ovary, deeply lobed. Receptaculum seminis poral to ovary and lateral to vitelline gland. Uterus a median stem with approximately 20 lateral branches each side, each branch subdivided.

Host.—*Apodemus sylvaticus*, *Rattus marungensis*, rat "tschakoja".

Locality.—Belgian Congo, Dahomey England.

Literature.—Baer 1925f, 244 : Baylis 1926a, 462 : 1927b, 434 : Joyeux and Baer 1927a, 35.

C. pusilla (Goeze 1782).

Synonymy.—

cateniformis glirium Gmelin 1790 : *Taenia*

glirium Gmelin 1790 : *Taenia*.

? *imbricata* Diesing 1854 : *Taenia*.

pusilla Goeze 1782 : *Alyselminthus*; *Catenotaenia*, *Cattotaenia*; *Halysis*, + *Taenia*.

Diagnosis.—Length 60-80, greatest breadth 0.75-1.65. Scolex 0.3 dia. Ventral excretory vessel without plexus. Genital pore rather anterior. Cirrus-sac 0.214 long, extending to excretory vessels. Testes 70, in 2-3 dorso-ventral layers. Ovary rather sac-like, lobed, median. Vitelline gland poral, posterior to ovary, lobed. Uterus with 9-13 primary lateral branches each side. Outer egg-shell 0.029 dia.

Taenia imbricata Diesing 1854 from *Mus musculus*, Ireland, is considered by Blanchard (1891, 67) a synonym of this species. As the original description is wholly inadequate for identification and as the form has not since been recorded, the species should be ignored.

Host.—*Apodemus sylvaticus*, *Mus musculus*, *Rattus norvegicus*, *R. rattus*.

Locality.—England, France, Germany, Ireland, U.S.A.

Literature.—Bellingham 1844, 320 : Dujardin 1845, 580 : Janicki 1906, 567 : Lühe 1910, 47 : Leidy 1904, 75 : Podiapolsky 1924, 12 : Shipley 1908, 76 & 82 : Stieda 1862, 205.

Table of species of *Catenotaenia*.

Species.	Extent of cirrus-sac.	No. of testes.	Position of vitelline gland.	No. of uterine branches.
<i>C. lobata</i> Baer 1925	Not to excretory vessel.	200	Lateral to ovary.	20
<i>C. pusilla</i> (Goeze 1782)	To excretory vessels.	70	Posterior to ovary.	9—13

Echinococcus Rudolphi 1810.

Diagnosis.—Taeniidae : Proglottides 4-5, only the posterior gravid. Scolex armed with a double crown of hooks. Larval stage a bladderworm with a thick laminated wall and with or without internal or external daughter cysts : brood capsules develop in the cysts and contain several scoleces. Adults in Carnivora, larval stages in herbivorous and omnivorous animals.

Type-species.—*E. granulosus* (Batsch 1786).

E. granulosus (Batsch 1786).

Synonymy.—See Meggitt 1924, 83.

Diagnosis.—Length 5-7, greatest breadth 0.6. Scolex 0.3 dia. Rostellar hooks 28-50, large 0.022-0.03, small 0.081-0.022 long. Proglottides 4. Testes 40-60, mostly anterior and posterior to female glands. Cirrus-sac 0.5 long, extending past excretory vessel. Eggs 0.032-0.036 x 0.03.

Host.—(larval, Murinae only) *Mus musculus*.

Locality.—Cosmopolitan.

Literature.—Cameron 1926, 18 : Hall 1919, 56 : Brumpt 1922, 444.

Multiceps Goeze 1782.

Diagnosis.—Taeniidae: Strobilus similar to that of *Taenia*. Larval stage a bladderworm with several scoleces. Adults in carnivores, larval stages in herbivores.

Type-species.—*M. multiceps* (Leske 1780).

M. radians Joyeux, Richet and Schulmann 1922.

Diagnosis.—Scolex 0.6 dia. Rostellar hooks in two rows, 14-16 in each, total 28-32: large hooks 0.06-0.106 long, alternating with the small hooks 0.04-0.075 long. Adult unknown.

Host.—*Mus musculus*.

Locality.—France.

Literature.—Joyeux, Richet and Schulmann 1922, 181.

M. serialis (Gervais 1847).*Synonymy*.—

cerebralis leporis-cuniculi Diesing 1863: *Coenurus cuniculi* Diesing 1863: *Coenurus*.

lowzowi Lindemann 1867: *Coenurus*.

polycephalus Reinetz 1885: *Cysticercus*.

pisiformis of Neumann and Mayer 1924: *Cysticercus*.

serialis Gervais 1847. *Coenurus*, *Multiceps*, ⁺*Taenia*.

sp. Turner 1919: *Coenurus*.

Diagnosis.—Length 200-720, greatest breadth 2.5-3.0. Scolex 0.85-1.5 dia. Rostellum 0.39 dia. Rostellar hooks 26-32, in two rows, large and small hooks alternating: large 0.135-0.175 long, small 0.078-0.12. Uterus with 20-25 lateral branches, each often subdividing and anastomosing. Eggs 0.031-0.034 x 0.029-0.03. Adults in dogs, larval stage in rodents.

Host (larval, Murinae only).—*Cricetomys gambianus*, *Rattus norvegicus*.

Locality.—Cosmopolitan.

Literature.—Hall 1919, 51: Turner 1919, 136.

Taenia Linnaeus 1758.

Diagnosis.—Taeniidae: Strobilus usually large, with numerous proglottides. Rostellum armed with a double crown of hooks. Adults in mammals.

Type-species.—*T. solium* Linnaeus 1758.

T. crassiceps (Zeder 1800).*Synonymy*.—

crassiceps Zeder 1800: *Alyselminthus*, ⁺*Taenia*.

longicollis Krabbe and Leuckart: *Cysticercus*.

polyacantha Leuckart 1856: *Taenia*.

talpae Bendz 1842: *Cysticercus*.

Diagnosis.—Length 200, greatest breadth 4·5. Scolex 0·75-0·9 dia. Rostellar hooks 32-34, large 0·186-0·207 long, small 0·129-0·135. Uterus with 8-10 lateral branches. Eggs 0·025-0·028 dia. Adults in dogs, larval stage an externally budding cysticereus in rodents.

Host (larval, Murinae only).—*Mus musculus*, *Rattus rattus*, *R. rattus alexandrinus*.

Locality.—France, Germany, Roumania, Switzerland.

Literature.—Baer 1925d, 51: 1925g, 77. Braun 1896, 417; Lühe 1910, 46.

***T. hydatigena* (Pallas 1766).**

Synonymy.—See Meggitt 1924, 87.

Diagnosis.—Length 750-5000, greatest breadth 7·5. Scolex 1·0 dia. Rostellum with a double crown of 30-48 hooks, large and small hooks alternating; large hooks 0·17-0·22 long, small 0·11-0·16. Uterine branches 5-10, with a few secondary diverticulae. Eggs 0·038-0·039 x 0·034-0·035. Adults in carnivora: larval stage a bladderworm in liver or viscera of Primates, Ungulates, and Rodentia.

Host (larval, Murinae only).—*Apodemus sylvaticus*, *Mus musculus*, *Rattus norvegicus*, *R. rattus*.

Locality.—Cosmopolitan.

Literature.—Braun 1905, 54; Cobbold 1879, 296; Galli-Valerio 1917, 46; Hall 1919, 29; Thienemann 1906, 13.

***T. pisiformis* (Bloch 1780).**

Synonymy.—See Meggitt 1924, 91.

Diagnosis. Length 600-2000, greatest breadth 4·8. Rostellum 0·515-0·64 dia. Rostellar hooks 34-48, in two rows, large and small hooks alternating; large 0·225-0·294 long, small 0·132-0·177. Uterine branches 8-14. Eggs 0·037 by 0·032. Adults in carnivores, larval stage in rodents.

The records from this host are probably due to confusion with *T. taeniaeformis*. In one rat examined, the liver was thickly studded with small cysts, each containing a single scolex and no proglottides: the cyst wall was thin and the whole appearance similar to that of *T. pisiformis*. As such they were at first diagnosed, *T. taeniaeformis* usually being found singly, at most two in any one host. Careful drawings of the hooks though, showed so close an agreement with those of the latter species that separation was impossible.

Host (larval, Murinae only).—*Mus musculus*, *Nesocia bengalensis*, *Rattus rattus*.

Locality.—Cosmopolitan.

Literature.—Hall 1919, 25; Galli-Valerio 1911, 358; Southwell 1912, 275.

T. solium Linnaeus 1758.

Synonymy.—See Meggitt 1924, 93.

Diagnosis.—Length 2000-3000, greatest breadth 5-6. Scolex 0.6-1.0 dia. Rostellar hooks 25-50, in two rows, large and small hooks alternating: large 0.16-0.18 long, small 0.11-0.14. Uterine branches 7-10. Eggs 0.31-0.56 dia. Adults in Primates, larval stage a cysticercus in the musculature of Ungulata, Rodentia, and Primates.

Host (larval, Murinae only).—*Mus* sp., *Rattus* sp.

Locality.—Cosmopolitan

Literature.—Brumpt 1922, 420; Moniez 1880, 58.

(The records of this species from rodents are probably due to confusion with other larval parasites.)

T. taeniaeformis (Batsch 1786.)

Synonymy.—See Meggitt 1924, 94.

Diagnosis.—Length 150-600, greatest breadth 5-6. Scolex 1.7 dia. Rostellar hooks 26-52, in two rows, large and small hooks alternating: large 0.38-0.42 long, small 0.25-0.27. Suckers prominent and anteriorly directed. Uterine branches 15-20, parallel, without much subdivision. Eggs 0.031-0.037 dia. Adults in carnivorus, larval stage a segmented cysticercus in rodents.

This species has recently been made the type of a new genus, *Reditaenia* by Sambon (1924) who later, on the suggestion of Stiles and Orlemann (1925), changed the name to *Hydatigera* Lamarck 1816, *Reditaenia* being a synonym. The basis of this separation is the presence in the encysted larval form of distinct proglottides though without genital organs. The generic value of this character appears dubious. *Multiceps*, proposed by Stiles and Stevenson (1905) for *Taenia multiceps* (i.e. *T. coenurus*) on the basis of the multiple budding of the coenurus accompanied by slight variations in the shape of the rostellar hooks and the presence of a reflex vaginal loop, has not met with general acceptance, Baer (1925d, 49) and Cameron (1926, 13) for example refusing recognition. The question of whether larval characters should of themselves constitute a generic difference is debatable. Should they not so be allowed, there are no grounds for the retention of *Multiceps* and *Hydatigera*; on the other hand if, as is held by the present authors, these characters be valid, then the two genera have an arguable case. Hall (1919, 13) states, "It seems advisable to restrict the generic name *Taenia* to those forms which have a cysticercus stage in the life-history. These alone make up a large group with a fairly close similarity in the adult and larval stages. To retain in this already large genus forms having a coenurus or echinococcus larva seems unnecessary and undesirable. Long ago Leuckart (1886d) wrote;

"The *Coenurus* is related to the *Cysticereus* as a compound to a simple animal—a sufficient reason for systematic zoologists to separate them." Generic rank is accorded to particular groups of species which in the course of evolution have retained distinctive characteristics and I see no reason for withholding such rank from forms in which these distinctive characteristics occur in the larva instead of the adult." Similarity between larval forms is usually held to be a proof of common descent, such proof outweighing differences between adults. Conversely, a difference between larval forms should be considered sufficient for the separation of the adults. Returning to the question of *Multiceps* and *Hydatigera*, the sole claim of the latter to generic rank consists in the precocious segmentation of the strobilus. This distinction is one of degree only: in other members of the genus *Taenia* s. lat., e.g. *T. pisiformis*, the scolex may form one or two proglottides while still in the larval state: on the other hand, as has just been stated, scoleces of *T. taeniaeformis* may occur without any attached proglottides. The larva of *Multiceps* has a totally different character from those of the remaining species of *Taenia* s. lat. For these reasons, while the genus *Multiceps* is here accepted, *Hydatigera* is considered a synonym of *Taenia*.

Host. (larval, Murinae only).—*Apodemus sylvaticus*, *Mus musculus*, *M. musculus wagneri*, *Rattus norvegicus*, *R. rattus*.

Locality.—Cosmopolitan.

Literature.—Hall 1919, 11.

Table of species of *Echinococcus*, *Multiceps* and *Taenia*.

Species.	No. of rostellar hooks.	Size of large hook (in μ).	Size of small hooks (in μ).	Larva.
<i>Echinococcus granulosus</i> (Batsch 1786)	28—50	22—30	18—22	<i>Echinococcus</i> .
<i>Multiceps radians</i> Joyeux, Richet and Schulmann 1922.	28—32	10—105	40—75	<i>Coenurus</i> .
<i>M. serialis</i> (Gervais 1847) ..	26—32	135—175	78—120	do
<i>Taenia crassiceps</i> (Zeder 1800) ..	32—34	186—207	129—135	<i>Cysticercus</i> with external budding.
<i>T. hydatigena</i> (Pallas 1766) ..	30—48	170—220	110—160	<i>Cysticercus</i> , often <i>coenurus</i> in form.
<i>T. pisiformis</i> (Bloch 1780) ..	34—48	225—294	132—177	<i>Cysticercus</i> .
<i>T. solium</i> L. 1758 ..	25—50	160—180	110—140	<i>Cysticercus</i> .
<i>T. taeniaeformis</i> (Batsch 1786) ..	26—52	380—420	250—270	<i>Cysticercus</i> , usually with attached segmented portion.

Order **Pseudophyllidea** Carus 1863.

Diagnosis.—Scolex with two bothridia of varying form, or with a pseudoscolex. External segmentation often absent or incomplete. Proglottides usually all in the same state of development. Genital pore surficial or marginal. Testes may be and vitelline follicles are in cortical parenchyma. Vitellarium of scattered follicles. Uterus persistent. Eggs discharged from proglottis while latter still attached to strobilus. Onchosphere often with ciliated coat (coracidium). Development, where known, a proceroid in body-cavity of Entomostraca, followed by a plerocercoid in Teleosts and reptiles. Adults in mammals birds, reptiles and fish.

Family **Diphyllobothriidae** Lühe 1910.

Diagnosis.—Pseudophyllidae : A single, rarely double, set of genital organs in each proglottis. Genital pores surficial; cirrus-sac and vagina with a common pore anterior to and on the same surface as the uterine pore. Uterus a long coiled canal, often rosette-shaped. Eggs operculated. Adults in mammals, birds and reptiles. Larval stage a proceroid in the body-cavity of Entomostraca, followed by a plerocercoid in the musculature of teleosts and reptiles.

Type-genus.—*Diphyllobothrium* Cobbold 1858.

Sub-family **Diphyllobothriidae** Lühe 1910.

Diagnosis.—Diphyllobothriidae : Scolex clearly separated from strobilus. Bothridia vary in shape. External segmentation distinct. Adults in mammal, birds and reptiles. Larval stage as in the family.

Type-genus.—*Diphyllobothrium* Cobbold 1858.

Diphyllobothrium Cobbold 1858.

Diagnosis.—Diphyllobothriinae : Bothridia simple, elongated, fairly well developed. A single set of reproductive organs in each proglottis. Testes and vitelline glands lateral, but may coalesce anteriorly or posteriorly. Uterus a zig-zag canal extending anteriorly, the coils usually forming a rosette. Adults in mammals and birds. First larval stage a proceroid in Copepoda, second larval stage a plerocercoid in musculature of fish ; or second larval stage a simple or proliferating solid unsegmented form devoid of bothridia in the musculature of mammals birds and reptiles.

Type-species.—*D. stemmacephalum* Cobbold 1858.

D. mansonii Cobbold 1882.*Synonymy.*—

liguloides Leuckart 1886 : *Bothriocephalus*.

mansonii Cobbold 1882 : *Bothriocephalus*, *Dibothriocephalus*,
Diphyllobothrium, *Dibothrium*, †*Ligula*, *Plerocercoides*, *Sparganum*.
ratticola Linstow 1904 : *Bothriocephalus*.

sp. Lathrop 1899 : *Taenia*.

Diagnosis.—

Adult.—Length 140-350, greatest breadth 6·0. Scolex 1·0-1·5 by 0·4-0·5, provided with two lateral bothridia. Proglottides longer than broad except in posterior portion of strobilus where they are square. Testes 380-540, 0·135-0·16 dia., generally in a single layer, in two lateral fields separated by the female glands and which may or may not join anteriorly to genital pore. External vesicula seminalis well developed, muscular. Male and female genital pores at anterior 3/8 of proglottis. Uterus with three coils each side, largest posterior. Eggs variable, average 0·059 x 0·034. In carnivora.

Larval.—First larval stage a proceroid, elliptical, with tail bearing the onchospheric hooks, in Copepoda. Second larval stage 80-360 long, greatest breadth 1·1-1·2. Anterior extremity devoid of bothridia, usually flattened and broader than the following portion, sometimes with a small apical depression. Body often with external segmentation. Genital organs absent. In Primates, Ungulata, Carnivora, Anseriformes, Galliformes, Coraciiformes, Columbiformes, Anoura, Ophidia.

Host (larval, Murinae only).—*Rattus rattus alexandrinus*, Japanese rat.

Locality.—China, Japan, Singapore, Tonkin.

Literature.—Cassaux and Houdemer 1926, 802: Joyeux 1927, 226 : Linstow 1904, 682.

(*Bothriocephalus ratticola*, described by Linstow (1904, 682) from *Rattus rattus alexandrinus* at Singapore is, in all probability *D. mansonii*: none of the characters given suffice to distinguish it. Equally probable is the confusion of the larval stages of *D. mansonii* and *D. reptans* (Diesing 1850), the records from reptiles of the former being in reality records of the latter, the larval stages of the two being practically indistinguishable.)

SPECIES DUBIOUS.

Paranolocephala isomydis (Setti 1892).*Synonymy.*—

isomydis, Setti 1893 : *Hymenolepis*, *Raillietina*, †*Taenia*.

Diagnosis.—Length 30, greatest breadth 4·0. Scolex 0·35 dia. Rostellum and hooks absent ("inerme, senza rostello"). Genital pore irregularly

alternates, at centre of proglottis margin. Cirrus-sac not extending to excretory vessel (?). Eggs with pyriform apparatus (?), apparently scattered throughout the whole proglottis.

This species has been placed in the genus *Hymenolepis* by Meggitt (1924, 72) and in *Raillietina* by Baer (1925d, 55): the alternating genital pores separate it from the first, the absence of a rostellum from the second. The unarmed scolex, the excess of the width over the length of the proglottides, and the dubious presence of a pyriform apparatus rather ally it with the *Anoplocephalidae*, of which subfamily it approximates most closely to *Paranoplocephala*. *P. acanthocirrota* Baer 1925 has been recorded from an African rodent and is not unlike the present form. In the absence of any definite information however, *P. isomydis* can only be regarded as a dubious species.

Host.—*Arvicanthis Abyssinicus*.

Locality.—Eritrea, Tanganyika.

Literature.—Baer 1925d, 55; Meggitt 1924, 72: Parona 1909, 2 Setti 1893, 10.

INVALID SPECIES.

Cestode terminology is at present clogged with names of species, inadequately described originally, and now not seen for half or three quarters of a century, the types of which—if they can be located—are probably in too bad a state of preservation for systematic investigation. Such species should definitely be recognised as invalid and removed from host lists of which they often form appreciable percentage.

Taenia imbricata Diesing 1854.

"Os inerme" (p. 52). "Caput ovale. Haustellum breve. Collum Articuli imbricati, supremi brevissimi, subsequentes latiores quam longi, ultimus oblongus. Aperturæ genitalium marginales vage alternæ. Longit. $1\frac{1}{2}$ ". *Taenia pusilla*? Bellingham in: Ann. of nat. hist. xiv. 320. Habitaculum. Mus musculus: in intestinis tenuibus, in Hibernia (Bellingham)." (Diesing 1854, 54)

Considered by Blanchard (1891, 67) a synonym of *Catenotaenia pusilla* (Goeze 1782). As this form has not been seen since first found, and as the original description is wholly inadequate for identification, the species should be considered as invalid.

T. muris ratti (Creplin 1825).

"Muris Ratti intestina, quæ per 12 fere annos in spiritu frumenti adservata fuerant, perscrutando inveni aliquot *Taeniolas* coloris, a mala

conservatione sine dubio effecti sordidi, longitudinis ad octo lineas, latitudinis versus finum posticam circiter lineae quartam partem aequantis. *Caput*, rostello exserto, magis elongatum, hoc retracto, subglobosum, *osculis* lateralibus, satis magnis, orbicularibus visis instructum. *Rostellum* capite paulo brevius, capitatum et inerme. *Collum* cum capite continuum, quam hoc paulo angustius, elongatum. *Articuli* anteriores indistincti rugaeformes, tum distinctiores, semper tamen breves, subcuneati vel subcampanulati, marginibus scilicet lateralibus mox subconvexis, mox rectis, angulis acutis exstantibus. Posteriores *ovis* pleni. *Foramina* articulorum non conspicua.

Obs. In intestinis *Muris Ratti* Goeze quondam *Taeniam* pusillam, et cl. ab Olfers in Brasilia *Taeniam* aliam reperit, quam ill. Rudolphi sub nomine *T. diminutae* in Synopsi sua pp. 689 et 690 descripsit. Ab his species nostra diversissima est, forsitan autem est eadem cum *Taenia*, quam Museum Viennense in intestinis *Murium Ratti* et *decumani* inventam inter. dubias posuit, et cujus descriptio nondum prostat." (Creplin 1825 73). Not seen subsequently.

***T. muris-sylvatici* Rudolphi 1819.**

Host.—*Apodemus sylvatici*.

This species consists of a few headless fragments described by Rudolphi and not seen since. Considered dubious by Janicki (1906, 581).

***T. musculi* Rudolphi 1810**

Host.—*Mus musculus*.

Considered by Diesing (1850, 551) as a synonym of *T. tenella* Pallas 1781, i.e. *Diphyllbothrium latum* (L. 1758), by Molin (1861, 250) as a possible synonym of *T. umbonata* Molin 1861, by Janicki (1906, 581) as a dubious species. In view of the uncertainty whether it be a Cyclophyllidean or a Pseudophyllidean, and of the fact that larval forms of both groups have been described from the mouse, the species is obviously unrecognisable and should be considered invalid.

***T. ratti* Rudolphi 1819.**

Host.—*Mus musculus*.

Considered by Diesing (1850, 500) a synonym of *Hymenolepis diminuta*, by Janicki (1906, 581) a dubious species. Not seen since.

***T. umbonata* Molin 1861.**

Host.—*Mus musculus*, *Rattus rattus*

"Caput subglosum, centro obsolete umbonatum, acetabulis circularibus cruciatim oppositis circa majorem capitis circulum; collum longum angustatum; corpus retrorsum dilatatum; articuli supremi quadrati, posteriores oblongi imbricato-perfoliati, ultimi bacillares; aperturæ genitales marginales, vage alternæ. Longit, 0.064; lat. 0.005.

Habitaculum. *Mus musculus*: intestino tenui, Novembri, Patavii (Molin)" (Molin 1861, 250). Considered by Blanchard (1891, 67) as possibly identical with *Catenotaenia pusilla* (Goeze 1782) and as dubious by Janicki (1906, 582).

Key to species of tapeworms from rats and mice.

- | | |
|--|----------------------------------|
| 1. Adult forms | (2) |
| Larval forms | (21) |
| 2. Scolex armed with T-shaped hooks, eggs | |
| in egg capsules | (3) |
| Scolex armed with hooks not T-shaped | (12) |
| Scolex unarmed | (14) |
| 3. Genital pores unilateral | (5) |
| Genital pores alternate | (4) |
| 4. Acetabular hooks present, rostellar hooks | |
| 20 μ , testes 90 | <i>Raillietina polycalceola.</i> |
| Acetabular hooks present, rostellar hooks | |
| 8 μ , testes 19-21 | <i>R. trapezoides.</i> |
| Acetabular hooks absent, rostellar hooks | |
| 18-22 μ , testes 19-21 | <i>R. fluxa.</i> |
| 5. Egg capsules containing only a single egg | (6) |
| Egg capsules containing more than one | |
| egg | (7) |
| 6. Acetabular hooks present, rostellar hooks | |
| 12 μ | <i>R. retractilis.</i> |
| Acetabular hooks absent, rostellar hooks | |
| 32 μ | <i>R. blanchardi.</i> |
| 7. Rostellar hooks 67 μ | <i>R. kordofanensis.</i> |
| Rostellar hooks less than 30 μ | (8) |
| 3. Acetabular hooks present | (9) |
| Acetabular hooks absent | (10) |
| 9. Rostellar hooks 120, size ? | <i>R. gracilis.</i> |
| Rostellar hooks 250-260, 22-25 μ | <i>R. indica.</i> |
| Rostellar hooks 180, 23-32 μ | <i>R. fatalis.</i> |

- | | |
|---|---------------------------------------|
| 10. Rostellar hooks 12-16, cirrus-sac reaching nerve, testes 26-30 | <i>R. baeri.</i> |
| Rostellar hooks 19-22, cirrus-sac reaching excretory vessels, testes 35-40 .. | <i>R. funebris.</i> |
| Rostellar hooks 21-26, cirrus-sac to nerve, testes 26-39 | .. (11) |
| 11. Egg capsules 180-200 | <i>R. celebensis</i> |
| Egg capsules 100-120 | <i>R. celebensis paucicap-sulata.</i> |
| 12. Genital pore alternates, testes more than three | <i>Choanotaenia</i> sp. |
| Genital pore unilateral, testes more than three | <i>Chitinolepis mjöbergi.</i> |
| Genital pore unilateral, testes three | .. (13) |
| 13. Rostellar hooks 12-14, 24 μ | <i>Hymenolepis globirostris.</i> |
| Rostellar hooks 20, 105 μ | <i>H. muris-variegata.</i> |
| Rostellar hooks 20-30, 14-18 | <i>H. nana.</i> |
| Rostellar hooks 28, size? | <i>H. contracta.</i> |
| Rostellar hooks 30, 11 μ | <i>H. microstoma.</i> |
| 14. Eggs in egg capsules | .. (15) |
| Eggs in uterus | .. (17) |
| 15. Genital pore alternates | <i>Oochoristica symmetrica.</i> |
| Genital pore unilateral | .. (16) |
| 16. Testes 6-7, cirrus-sac extending past excretory vessels, egg capsules 6 .. | <i>Inermicapsifer aberratus.</i> |
| Testes 30-50, cirrus-sac not extending to excretory vessels, egg capsules 10-50.. | <i>I. arvicanthidis.</i> |
| Testes 70-130, cirrus-sac not extending to nerve, egg capsules 30-130 .. | <i>I. guineensis.</i> |
| 17. Uterus with median stem and lateral .. branches | .. (18) |
| Uterus sac-like | .. (19) |
| 18. Testes 200, uterus with 20 branches .. | <i>Catenotaenia lobata.</i> |
| Testes 70, uterus with 9-13 branches .. | <i>C. pusilla.</i> |
| 19. Testes 3, genital pore unilateral | .. (20) |
| Testes more than 3, genital pore alternates | <i>Paranoplocephala isomydis.</i> |
| 20. Rostellum present, eggs 54 μ x 86 μ , without filaments | <i>Hymenolepis diminuta.</i> |
| Rostellum absent, eggs 34 μ x 68 μ , with filaments | <i>H. horrida.</i> |
| 21. Larval form solid | .. (22) |
| Larval form bladder-like | .. (23) |

MEGGITT AND SUBRAMANIAN—TAPEWORMS OF MURINAE.

22. Bothridia two *Diphyllbothrium mansonii*
 Suckers four *Mesocetoides lineatus*.
 Suckers four *Dithyridium*.
23. Larval form a coenurus or echinococcus .. (24)
 Larval form a cysticercus (25)
24. Rostellar hooks 28-35, large 22-30 μ ,
 small 18-22 μ *Echinococcus granulosus*.
 Rostellar hooks 28-32, large 60-105 μ , small
 40-75 μ *Multiceps radians*.
 Rostellar hooks 26-32, large 135-175 μ , small
 78-120 μ *M. serialis*.
25. Rostellar hooks 25-50, large 160-180 μ , small 110-114 μ *Taenia*
solium.
 Rostellar hooks 30-48, large 170-220 μ , small 110-160 μ *T. hydatigena*.
 Rostellar hooks 32-34, large 186-207 μ , small 129-135 μ *T. crassiceps*.
 Rostellar hooks 34-48, large 225-294 μ , small 132-177 μ *T. pisiformis*.
 Rostellar hooks 26-52, large 380-420 μ , small 250-270 μ *T. taeniae-*
formis

LIST OF HOSTS

Acomys musschenbroeki Jentink 1878.

Raillietina
polycalceola (Janicki 1902)

Apodemus sylvaticus (L.1766).

Catenotaenia.
lobata Baer 1925.
pusilla Goeze 1782.

Hymenolepis
diminuta (Rudolphi 1819).
nana Siebold 1852.
 sp. Baylis 1927a.

Taenia
 **hydatigena* (Pallas 1766).
 **taeniaeformis* (Batsch 1786).

Arvicanthis abyssinicus Rüppel 1845.

Hymenolepis.
nana (Siebold 1852).

Paranoplocephala.
isomydis (Setti 1893).

Raillietina.
polycalceola (Janicki 1902),

A. barbatus pulchellus Gray.

Hymenolepsis
diminuta (Rudolphi 1819).

A. niloticus (Geoffroy 1803).

Hymenolepis
muri-variegatus Janicki 1904.

Raillietina.
trapezoides (Janicki 1904).

A. pumilio (Sparrmann 1784).

Raillietina.
*trapezoides** (Janicki 1904).

A. pumilio bechuanæ Thomas 1892.

Raillietina
trapezoides (Janicki 1904).

A. testicularis kordofanensis.

Inermicapsifer
arvicanthidis (Kofend 1917).

Raillietina
kordofanensis n. sp.

A. sp.

Inermicapsifer
arvicanthidis (Kofend 1917).

Cricetomys gambianus (Waterhouse 1840).

Inermicapsifer
guineensis (Graham 1908).

Multiceps
**serialis* (Gervais 1847).

Golunda campanæ Huet 1888.

Inermicapsifer
arvicanthidis (Kofend 1917).

Micromys agrarius (Pallas 1778).

Hymenolepis
nana (Siebold 1852).

M. minutus (Pallas 1778).

Hymenolepis
nana (Siebold 1852).

Mus flavidulus.

Raillietina
gracilis (Janicki 1904).

M. moggi.

Inermicapsifer
aberratus (Baer 1924).
arvicanthidis (Kofend 1917)

M. musculus L. 1766.

Catenotaenia
pusilla (Goeze 1782).
Dithyridium
*spp. Skrjabin & Schulz 1926.

Echinococcus
**granulosus* Batsch 1786.

Hymenolepis
contracta Janicki 1904.
diminuta (Rudolphi 1819).
microstoma (Dujardin 1845).
nana (Siebold 1852).
**nana* (Siebold 1852).
sp. Leon 1908.

Mesocestoides
**lineatus* (Goeze 1782).

Multiceps
**radians* Joyeux, Richet & Schulmann 1922.

Taenia
**crassiceps* (Zeder 1800).
**hydatigena* (Pallas 1766).
**pisiformis* (Bloch 1780).
**taeniaeformis* (Batsch 1786).

M. musculus wagneri Nordmann

Hymenolepis
nana (Siebold 1852)

Taenia
**taeniaeformis* (Batsch 1786).

M. sp.*Hymenolepis**nana* (Siebold 1852).*Inermicapsifer**guineensis* (Graham 1908).*Raillietina**trapezoides* (Janicki 1904).*Taenia***solium* L. 1758.**Nesocia bengalensis** (Gray 1833)*Raillietina**celebensis* (Janicki 1902).*celebensis paucicapsulata* n. var.*fatalis* n. sp.*funebis* n. sp.*indica* n. sp.*Taenia***pisiformis* (Bloch 1780).**taeniaeformis* (Batsch 1786).**Rattus coucha** (Smith 1836).*Raillietina**baeri* n. sp.**R. damarensis** (de Winton 1897).*Inermicapsifer**guineensis* (Graham 1908).**R. marungensis** (Noack 1887).*Catenotaenia**lobata* Baer 1925.**R. meyeri** (Jentink 1879).*Raillietina**celebensis* (Janicki 1902).**R. norwegicus** (Erxleben 1777).*Catenotaenia**pusilla* (Goeze 1782).*Dithyridium***elongatum* (Blumenberg 1882).**sp.* Skrjabin & Schulz 1926,

Hymenolepis

- contracta* Janicki 1904.
- diminuta* (Rudolphi 1819).
- horrida* (Linstow 1900).
- microstoma* (Dujardin 1845).
- nana* (Siebold 1852).
- **nana* (Siebold 1852).

Inermicapsifer

- guineensis* (Graham 1908).

Mesocestoides

- **lineatus* (Goeze 1782).

Multiceps

- **serialis* (Gervais 1847).

Raillietina

- celebensis* (Janicki 1902).
- celebensis paucicapsulata* n. var.
- fatalis* n. sp.
- fluxa* n. sp.
- funnebris* n. sp.

Taenia

- **hydatigena* (Pallas 1766).
- **taeniaeformis* (Batsch 1786).

R. rajah (Thomas 1894).*Raillietina*

- blanchardi* (Parona 1898)

R. rattus (L. 1766).*Catenotaenia*

- pusilla* (Goeze 1782).

Hymenolepis

- diminuta* (Rudolphi 1819).
- microstoma* (Dujardin 1845).
- nana* (Siebold 1852).

Inermicapsifer

- guineensis* (Graham 1908).

Oochoristica

- symmetrica* (Baylis 1927).

Raillietina

- baeri* n. sp.
- retractilis* (Stiles 1895).

Taenia

- **crassiceps* (Zeder 1800).

- **hydatigena* (Pallas 1766).
- **pisiformis* (Bloch 1780).
- **solium* L. 1758.
- **taeniaeformis* (Batsch 1786).

R. rattus alexadrinus.

- Dipyllobothrium*
 - **mansoni* (Cobbold 1882).
- Hymenolepis*
 - diminuta* (Rudolphi 1819).
 - nana* (Siebold 1852).
- Taenia*
 - **crassiceps* (Zeder 1800).

R. rufinus (Temminck 1855).

- Inermicapsifer*
 - arvicanthidis* (Kofend 1917).

R. sabanus (Thomas 1887).

- Chitinolepis*
 - mjöbergi* Baylis 1926.
- Raillietina*
 - blanchardi* (Parona 1898).

R. siporanus (Thomas 1895).

- Raillietina*
 - blanchardi* (Parona 1898).

R. terrae-reginae (Alston 1877).

- Hymenolepis*
 - diminuta* (Rudolphi 1819).
- Choanotaenia*
 - sp. (Joyeux & Baer 1927a).
- Multiceps*
 - **serialis* (Gervais 1847).

Japanese rat

- Diphyllbothrium*
 - **mansoni* (Cobbold 1882).

Rat "houmba"

- Hymenoleis*
 - globirostris* Baer 1925.

Literature.

- Baer, J. G.** (1924a). Contribution a la faune helminthologique Sud-Africain. Note préliminaire. *Ann. Parasit.*, 2, 239-247.
- (1925c). Some cestoda described by Beddard, 1911-1920. *Ann. Trop. Med. Parasit.*, 19, 1-22.
- (1925d). Contributions to the helminth fauna of South Africa. Pretoria.
- (1925f). Sur quelques cestodes du Congo belge. *Rev. suisse Zool.*, 32, 239-251.
- (1925g). Cestodes de mammifères. 1. Les ténias du renard. *Bull. soc. neuchât. sci. nat.*, 50, 77-81.
- (1927). Monographie des cestodes de la famille des Anoplocephalidae. *Biol. bull. France. Belge*, suppl. 10.
- Baylis, H. A.** (1915). A new cestode of the genus *Zschokkeella*. *Ann. Mag. Nat. Hist.*, ser. 8, 16, 40-49.
- (1922). Observations on certain cestodes of rats, with an account of a new species of *Hymenolepis*. *Parasitol.*, 14, 1-8.
- (1924). The range of variation in *Hymenolepis nana* in rats and mice. *Parasitol.*, 16, 415-418.
- (1926). On a Trichostrongylid nematode from the wood-mouse. *Ann. Mag. Nat. Hist.*, ser. 9, 18, 455-464.
- (1926b). Some parasitic worms from Sarawak. *Sarawak Mus. Journ.*, 3, 303-322.
- (1927b). The cestode genus *Catenotaenia*. *Ann. Mag. Nat. Hist.*, ser. 9, 19, 433-439.
- Beddard, F. E.** (1911). Contributions to the anatomy and systematic arrangement of the Cestoidea. ii. On two new genera of cestodes from mammals. *Proc. Zool. Soc. London*, 994-1018.
- Bellingham, O'B.** (1844). Catalogue of Irish entozoa. *Ann. Mag. Nat. Hist.*, 14, 162-165 : 251-256 : 317-323, 396-403 : 471-479
- Blanchard, R.** (1891). Histoire naturelle et médicale des Téniaïdes du genre *Hymenolepis* Weinland. Paris.
- Braun, M.** (1896). Helminthologische Notizen. v. Ein proliferender *Cysticercus* und die zugehörige Tänie. Vorläufige Mittheilung. *Zool. Anz.*, 19, 417-20.
- Brumpt, E.** (1922). Précis de parasitologie. 3rd ed. Paris.
- Cameron, T. W. M.** (1925). The cestode genus *Mesocestoides* Vaillant. *Journ. Helminth* 3, 33-44.
- (1926). Observations on the genus *Echinococcus* Rudolphi 1801. *Ibid*, 4, 13-22.
- Casaux & Houdemer**, (1926). Note préliminaire sur les Sparganoses humaines et animales au Tonkin. *Bull. soc. path. exot.*, 19, 802-804.

- Chandler, A. C.** (1927d). The distribution of Hymenolepis infection in India, with a discussion of its epidemiological significance. *Ind. Journ. Med Res.*, 14, 973-994.
- Cobbold, T. S.** (1879). Parasites: a treatise on the entozoa of man and animals including some account of the ectozoa. London.
- Creplin, F. C. H.** (1825). Observations de entozois. *Gryphis valdiae*.
- Diesing, C. M.** (1850). Systema helminthum. Wien.
 ——— (1854). Ueber eine naturgemässe Vertheilung der Cephalocotyleen. *S. B. Kais. Akad. Wissen. Wien, math.-nat Kl.*, 13, 556-616.
- Dampf, A.** (1910). Ueber ein Cysticercoid aus einem Floh der Springmaus (*Alactaga jaculus*). *Centrbl. Bakt.*, Abt. i, Orig., 54, 452-454.
- Douthitt, A.** (1915). Studies on the cestode family Anoplocephalidae. *Illin. Biol. Monogr.*, 1, no. 3.
- Dujardin, F.** (1845). Histoire naturelle des helminthes ou vers intestinaux. Paris.
- Galli-Valerio, B.** (1911). Notes de parasitologie et de technique parasitologique. *Centrbl. Bakt.*, Abt. i, Orig., 60, 358-363.
 ——— (1917). Parasitologische Untersuchungen und Beiträge zur parasitologischen Technik. *Ibid*, 79, 41-48.
- Geddoelst, L.** (1925). A propos de l' *Hymenolepis diminuta* (Rud. 1819). *C. R. soc. biol.*, 93, 1529-1530.
- Graham, W. M.** (1909). Cestodes. Rep. on plague in Gold Coast in 1908, by W. J. Simpson.
- Grassi, B. and Rovelli, G.** (1889). Embryologische Forschungen an Cestoden. *Centrbl. Bakt.*, Abt. i, 5, 370-377: 401-410.
 ——— (1892a). Recherche embryologique sui cestodi. *Atti acad. Gioenia sci. nat. Catania*, 4, 108 pp.
- Hall, M. C.** (1919). The adult taenioid cestodes of dogs and cats, and of related carnivores in North America. *Proc. U. S. Nat. Mus.*, 55, 1-94.
- Hamann, O.** (1885). *Taenia lineata* Goetze. *Zeit. f. wissen. Zool.*, 42, 718-744.
- Hoeppli, R. I. C.** (1925). *Mesocestoides corti*. A new species of cestode from the mouse. *Journ. Parasit.*, 12, 91-96.
- Hungerbühler, M.** (1910). Studien an *Gyrocotyle* und Cestoden. *Jen. Denk. med. Ges.*, 16, 495-521.
- Janicki, C. V.** (1902). Über zwei neue Arten des Genus *Davainea*. *Arch. Parasit.*, 6, 275-292.
 ——— (1906). Studien an Säugetiercestoden. *Zeit. f. wissen. Zool.* 81, 505-597.

- Johnston, T. H.** (1918). Notes on certain entozoa of rats and mice, together with a catalogue of the internal parasites recorded as occurring in rodents in Australia. *Proc. R. Soc. Queensland*, 30, 53-78.
- Joyeux, C.** (1916). Sur le cycle évolutif de quelques cestodes. *Bull. soc. path. exot.*, 9, 578-583.
- (1919). *Hymenolepis nana* (v. Siebold 1852) et *Hymenolepis nana* var. *fraterna* Stiles 1906. *Ibid*, 12, 228-231.
- (1920). Cycle évolutif de quelques cestodes. Recherches expérimentales. *Bull. biol. France Belge*, suppl. 2.
- (1922). Recherches sur l' *Urocystis prolifer* Villot, note préliminaire. *Bull. soc. zool. France*, 47, 53-58.
- (1924). List de quelques helminthes récoltés dans les colonies portugaises d'Afrique. *Ann. Parasit.*, 2, 232-235.
- (1925). *Hymenolepis nana* et *Hymenolepis fraterna*. *Ann. Parasit.*, 3, 270-280.
- (1927). *Diphyllobothrium mansonii* (Cobbold, 1883) (Note préliminaire). *Bull. soc. path. exot.*, 20, 226-228.
- & Baer, J. G. (1927). Recherches sur quelques espèces du genre *Bothridium* de Blainville, 1824 (Diphyllobothriidae). *Ann. Parasit.*, 5, 127-139.
- (1927a). Etudes de quelques cestodes provenant des colonies françaises d'Afrique et de Madagascar. *Ibid*, 5, 27-36.
- & Kobozeff, N. I. (1927). Recherches sur l' *Hymenolepis microstoma* (Dujardin, 1845). *C. R. soc. biol.*, 97, 12-14.
- & Mathias, P. (1926). Cestodes et trématodes récoltés par le professeur Brumpt au cours de la mission du Bourg de Bozas. *Ann. Parasit.*, 4, 233-336.
- Joyeux, C., Richet C. and Schulmann, E.** (1922). Description d'un cénure trouve chez la souris blanche de laboratoire. *Bull. soc. zool France*, 47, 181-186.
- Kofend, L.** (1917). Wissenschaftliche Ergebnisse der mit Unterstützung der Akademie der Wissenschaft in Wien aus der Erbschaft Treitl von F. Werner unternommenen zoologischen Expedition nach dem Anglo-Ägyptischen Sudan (Kordofan) 1914. *Anz. Akad. Wissen. Wien*, 54, 229-231.
- (1921). Wissenschaftliche Ergebnisse der mit Unterstützung der Akademie der Wissenschaft in Wien aus der Erbschaft Treitl von F. Werner unternommenen zoologischen Expedition nach dem Anglo-Ägyptischen Sudan (Kordofan) 1914. v. Cestoden aus Säugetieren und aus *Agama colonorum*. *Denk. Akad. Wissen. Wien*, math.-nat. Kl., 98.
- Leidy, J.** (1904). Researches in helminthology and parasitology, arranged by J. Leidy Junr. *Smithson. Misc. Coll.*, 46, 1-281.

- Leon, N.** (1908). Contribution a l'étude des parasites animaux de Roumanie. *Bull. med. nat. Iassy*.
- Linstow, O. V.** (1901). *Taenia horrida*, *Tetrabothrium macrocephalum* und *Heterakis distans*. *Arch. f. Naturg.*, 67, 1-9.
- (1904). Neue Helminthen. *Centrbl. Bakt.*, Abt. i, Orig., 38, 678-683.
- Lühe, M.** (1910). Parasitische Plattwürmer. ii. Cestodes. In : Die Süßwasserfauna Deutschlands, H. 18.
- Meggitt, F. J.** (1921). On a new cestode from the pouched rat, *Cricetomys gambianum*. *Parasitol.*, 13, 193-204.
- (1924). The cestodes of mammals. London.
- Molin, R.** (1861). Prodrromus faunae helminthologicae venetae. *Denk. Kais. Akad. Wissen. Wien.*, math.-nat. Kl., 29, 189-338.
- Moll, A. M.** (1917). Animal parasites of rats at Madison, Wisconsin. *Journ. Parasitol.*, 4, 89-90.
- Moniez, R.** (1880). Essai monographique sur les cysticerques. Paris.
- Nevue-Lemaire, M.** (1912). Parasitologie des animaux domestiques. Paris.
- Nicoll, W. and Minchin E. A.** (1911). Two species of cysticercoïds from the rat-flea, (*Ceratophyllus fasciatus*) *Proc. Zool. Soc. London*, 9-13.
- Parona, C.** (1898). Elminti raccolti dal Dott. Elio Modigliani alle isole Mentawai Eugano e Sumatra. *Ann. mus. civ. stor. nat. Genova* ser. 2, 19, 102-124.
- (1909). Estratto dal volume lo dell'opera Il Ruwenzori, relazioni scientifiche : vermi parassiti di vertebrati.
- Podiapolsky, B.** (1924). Zur Kenntnis der Fauna der parasitischen Würmer bei Ratten. Moscow.
- Railliet, A.** (1893). Traité de zoologie médicale et agricole. 2 ed. Paris.
- Ransom, B. H.** (1904). An account of the tapeworms of the genus *Hymenolepis* parasitic in man. *Bull. Hyg. Lab., U. S. Pub. Health Mar. Hosp. Serv.*, 18.
- (1920). In : Proc. Helminth. Soc. Washington. *Journ. Parasitol.*, 7, 1921, 188.
- Saheki, Y.** (1925). An experimental study on the development of the dwarf tapeworm (*Hymenolepis nana*). *Ann. Trop. Med. Parasit.*, 19, 305-308.
- Sambon, L. R.** (1924). *Journ. Trop. Med.* 479.
- Scott, H. H.** (1923). A contribution to the experimental study of the life histories of *Hymenolepis fraterna* Stiles, 1906, and *Hymenolepis longior* Baylis, 1922, in the mouse. *Journ. Helminth.* 1, 193-196.

- Setti, E. (1893). Elminti dell'Eritrea e delle regioni limitrofe. *Atti. soc. ligust. sci. nat. geogr. Genova*, 4, 3-21.
- Shipley, A. E. (1908). Rats and their animal parasites. *Journ. Econ. Biol.*, 3, 61-83.
- Skrjabin, K. J. and Schulz, R.E. (1926). Affinites entre les *Dithyridium* des souris et le *Mesocetoides lineatus* (Goeze, 1782) des carnivores. *Ann. Parasitol.*, 4, 68-73.
- Smith, A. J. (1908). Synopsis of studies in metazoan parasitology in McManus laboratory of parasitology, University of Pennsylvania. *Univ. Penn. Med. Bull.*, 20, 262-282.
- Southwell, T. (1921). Cestodes from African rats. *Ann. Trop. Med. Parasit.*, 15, 167-168.
- and Adler, S. (1924). *Zschokkeella guineensis*. *Ibid*, 18, 129.
- Stieda, L. (1862). Ein Beitrag zur Kenntniss der Tánien. *Arch. f. Naturg.*, 28, 200-209.
- Stiles, C. W. (1890). A revision of the adult tapeworms of hares and of rabbits. *Proc. U. S. Nat. Mus.*, 19, 145-233.
- and Orlemann, M. (1925). The cestode genus *Hydatigera* Lamarck, 1816, species *Reditaenia* Sambon, 1924. *Journ. Trop. Med. Hyg.*
- Thienemann, J. (1906). Untersuchungen über *Taenia tenuicollis* Rud. mit Berücksichtigung der übrigen Musteliden-Taenien. *Arch. F Naturg.*, 72, 227-248.
- Turner, M. (1919). On a coenurus in the rat. *Ann. Appl. Biol.*, 6, 136-141.
- Woodland, W. N. F. (1923b). The one-host life-cycle of *Hymenolepis fraterna*, Stiles, of the mouse. *Nature*, 112, 436.
- (1924b). On the development of the human *Hymenolepis nana*. (Siebold 1852) in the white mouse; with remarks on "*H. fraterna*", "*H. longior*" and "*H. diminuta*," *Parasitol.*, 16, 424-435.
- (1924d). On the life-cycle of *Hymenolepis fraterna* (*H. nana* var. *fraterna* Stiles) of the white mouse. *Parasitol.*, 16, 69-83.

THE MYXOPHYCEAE OF RANGOON, III.

BY

S. L. GHOSE, M.Sc., Ph.D., F.L.S.,
(Lecturer in Botany, University College, Rangoon).

Introduction.

Thirty species of Myxophyceae from Rangoon have already been described and figured by the writer in two earlier papers (Ghose 1926, 1927). In the present paper 13 more species, out of which one species and five varieties are new, are described.

References to literature cited in this paper have already been given in the two earlier instalments, the last of which was published in Vol. XVI, Part III of this Journal. For this reason no bibliography is given at the end of this paper.

SYSTEMATIC DESCRIPTION OF THE SPECIES OBSERVED.

Order I. *Coccogoneae* (Thüret) Kirchner.

Family *Chroococcaceae*.

Genus *Chroococcus* Näg.

1. *Chroococcus varius* A. Br. in Rabenh. Alg. Europ., No. 2451; De Toni 1907, p. 21; Lemmermann 1910, p. 54; Tilden 1910, p. 7; Pascher 1925, p. 79.

Plate II, Fig. 1.

Stratum gelatino-mucous, dark-brown. Cells globose, single, in twos or in fours, rarely in threes, without sheath 2-4 μ and with sheath 4-8 μ thick. Sheaths moderately thick, hyaline, indistinctly lamellose.

Habit. On the outer surface of earthen water-pots.

Genus *Gloeocapsa* Kütz.

2. *Gloeocapsa atrata* Kütz., Phyc. Germ., p. 151, Tab. Phycol. I, pl. 21, fig. 4; De Toni 1907, p. 57; Lemmermann 1910, p. 64; Tilden 1910, p. 19, pl. 1, fig. 22; Pascher 1925, p. 89, fig. 90; Turner 1892, p. 12.

Plate II, Fig. 2.

Stratum crustaceous, slimy, dark-brown. Cells globose, 9-12 μ thick with sheath and 3.5-4 μ thick without sheath, pale blue-green. Sheath thick, indistinctly layered, colourless.

Habit. In an algal culture in a big glass-dish.

Genus *Aphanocapsa* Näg.

Plate II, Fig. 3.

Stratum gelatinous, delicate, brownish. Cells generally single, globose, not very closely arranged, 7-12 μ thick, brownish-green.

Habit. In a pond, mostly adhering to submerged parts of aquatic plants.

The new species greatly resembles *Aph. testacea* Näg., but differs from it in having a delicate stratum, larger and more widely separated cells, and aquatic habit.

Order II. *Hormogoneae* (Thüret) Kirchner.Cohort *Psilonematae* Kirchner.Family *Oscillatoriaceae*.Genus *Oscillatoria* Vauch.

4. *Oscillatoria princeps* Vauch., Hist. des Conf., p. 190, pl. 15, fig. 2; Gomont 1893, p. 226, pl. 6, fig. 9; De Toni 1907, p. 150; Tilden 1910, p. 62, pl. 4., fig. 3; Lemmermann 1910, p. 109; Pascher 1925, p. 358, fig. 421.

Plate II, Fig. 4.

Stratum dark bluish-green, slimy. Trichomes mostly straight, not constricted at the joints, 18-24 μ thick, bright blue-green, slightly attenuated and a little curved at the apex. Cells 4-6 μ long, not granulated at the dissepiments. Apical cell convex, capitate, with slightly thickened membrane.

Habit. In Royal Lakes, free-swimming.

5. *Oscillatoria limosa* (Roth.) Ag., Dispos. Alg. Sueciae, p. 35; Gomont 1893, p. 210, pl. 6, fig. 13; De Toni 1907, p. 154; Tilden 1919, p. 65, pl. 4, fig. 6; Lemmermann 1910, p. 108; Pascher 1925, p. 357, fig. 420; *Oscillatoria limosa* (Roth.) Ag., Turner 1892, p. 13.

Plate II, Fig. 5.

Stratum dark bluish-green. Trichome more or less straight, not constricted at the joints, 11-14 μ thick. Cells 2-4 μ long, mostly granulated at the dissepiments. Apical cell flatly rounded, with thickened membrane.

Habit. In Royal Lakes, free-swimming.

6. *Oscillatoria curviceps* Ag., Syst. Alg., p. 68; Gomont 1893, p. 213; De Toni 1907, p. 157; Lemmermann 1910, p. 109; Tilden 1910, p. 67, pl. 4, fig. 7; Pascher 1925, p. 359, fig. 422; variety *angusta* var. nov.

Plate II, Fig. 6.

Stratum light or dark blue-green. Trichome more or less straight with a hook-like curve at the end, slightly attenuated at the apex, not constricted at the joints, 5-10 μ thick. Cells 2-3 μ long, sometimes granulated at the dissepiments. Apical cell broadly rounded, not capitate, with no thickened membrane.

Habit. In Royal Lakes, mixed up with the two above-mentioned species of *Oscillatoria*.

The new variety is narrower than the type-form, the trichomes of the latter being 10-17 μ in thickness.

7. *Oscillatoria amoena* (Kütz.) Gomont 1893, p. 225, pl. 7, fig. 9; De Toni 1907, p. 175; Lemmermann 1910, p. 115; Tilden 1910, 77, pl. 4, fig. 26; Pascher 1925, p. 370, fig. 450; variety *non-granulata* var. nov.

Plate II, Fig. 7.

Stratum more or less blue-green. Trichome straight, flexible, constricted at the joints near the apex, 4-5 μ thick. Cells quadrate, 3-4.2 μ long. Apex gradually tapering, straight or slightly bent. End-cell globose, capitate, with calyptra.

Habit. On damp ground which is exposed to direct sun-light.

The new variety differs in two things from the type-form (1) the trichomes are not constricted at the joints except near the apex, (2) the transverse walls are not marked by two finely granulated lines. The figures of the species, given by Pascher (Pascher 1925, fig. 450) and (Tilden 1910, pl. 4, fig. 26) do not appear to be very convincing as regards the presence of the two above-mentioned typical specific characters in the forms described by them.

Genus *Lyngbya* C. Agardh.

8. *Lyngbya Hieronymusii* Lemmermann, Forschungsber. d. Biol. State in Plon, XII, p. 146, pl. 4 figs. 12-13; Lemmermann 1910, p. 139, fig. 6; De Toni 1907, p. 266; Pascher 1925, p. 401; variety *crassi-vaginata* var. nov.

Plate II, Fig. 8.

Filaments single, free-swimming, straight or a little curved, 15-20 μ broad. Sheath thick, hyaline. Cells 11-14 μ broad, up to 10 μ long, not constricted at the joints, but granulated at the dissepiments, with pseudo-vacuoles. Apical cell not attenuated, broadly rounded.

Habit. Victoria Lakes, near the banks, free-swimming, intermingled with a species of *Bulbochaete* and *Westiella intricata*.

The new variety differs from the type-form in having much thicker sheaths.

Family **Nostocaceae**.

Genus **Anabaena** Bory.

9. *Anabaena variabilis* Kütz., Phyc. Gener., p. 120; Bornet et Flahault 1888, p. 226; De Toni 1907, p. 437; Lemmermann 1910, p. 179; Tilden 1910, p. 187, pl. 9, fig. 9; Pascher 1925, p. 317, fig. 363; Ghose 1923, p. 431.

Plate II, Fig. 9.

Stratum dark-green, mucilaginous, spreading on damp soil. Sheaths usually not present. Trichomes 4-5 μ in diameter, flexuous, slightly constricted at the joints. Cells barrel-shaped, 2.5-4 μ long. Heterocysts spherical or oval, 5-6 μ broad and up to 7 μ long. Spores 5-6 μ broad, 6-7 μ long, oval, slightly truncate at the apices, catenate, remote from heterocysts, with smooth wall. The spores observed were not quite mature.

Habit. On damp soil.

Family **Stigonemataceae**.

Genus **Westiella** Borzi.

10. *Westiella intricata* Borzi; Pascher 1925, p. 193, fig. 223.

Plate II, Fig. 10.

Filaments long, creeping amongst other algae, flexuous, irregularly branched, 7-9 μ thick. Branches single, as broad as the main filament, slightly attenuated at the apex. Cells usually cylindrical. Sheaths colourless, very narrow and inconspicuous. Heterocysts not seen. Hormocysts 2-8 celled, 12-16 μ thick, with a rough outer wall.

Habit. Victoria Lakes, near the banks, intermingled with species of *Chara*, *Hapalosiphon*, *Lyngbya* and *Bulbochaete*.

Genus **Hapalosiphon** Näg.

11. *Hapalosiphon Welwitschii* W. & G. S. West, Journal of Botany, Vol. 35, 1897, p. 242; De Toni 1910, p. 572; Lemmermann 1910, p. 226; Pascher 1925, p. 196; W. & G. S. West 1907, p. 240, pl. 12, figs. 29-32; variety *vaginatus* var. nov.

Plate II, Fig. 11.

Filaments sparse, creeping amongst other algae, slightly flexuous 7-10 μ broad, branches unilateral or distichous, short or long and sub-branched. Sheaths colourless but distinct. Cells 6-9 μ thick, globose, quadrate or oval. Heterocysts seen only in young filaments, intercalary, rare, 6 μ broad and 6.5 μ long. Spores not seen.

Habit. Victoria Lakes, near the banks, intermingled with species of *Westiella*, *Chara*, *Bulbochaete* and *Lyngbya*.

Unfortunately the original description of the species was not available to me, but I have examined the figures of the original African specimens of it as given in W. & G. S. Wests' paper on Algae from Burma, Bengal and Madras (W. & G. S. West 1907, pl. 12, figs. 29-32). The description of the species as given by Lemmermann and Pascher does not seem to fully agree with Wests' figures. According to the former, branches should be short and unilateral and sheaths very narrow and indistinct, but Wests' figures would clearly show the branches to be distichous, fairly long and even sub-branched and the sheaths to be quite distinct, though narrow. The new variety is characterised by having broader filaments and distinct sheaths.

Cohort *Trichophoreae* Kirchner.

Family *Rivulariaceae*.

Genus *Calothrix* Agardh.

12. *Calothrix scytonemicola* Tilden 1910, p. 265, pl. 17, fig. 7; Pascher 1925, p. 225, fig. 271.

Plate II, Fig. 12.

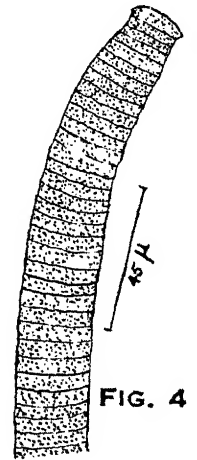
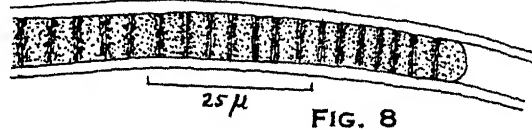
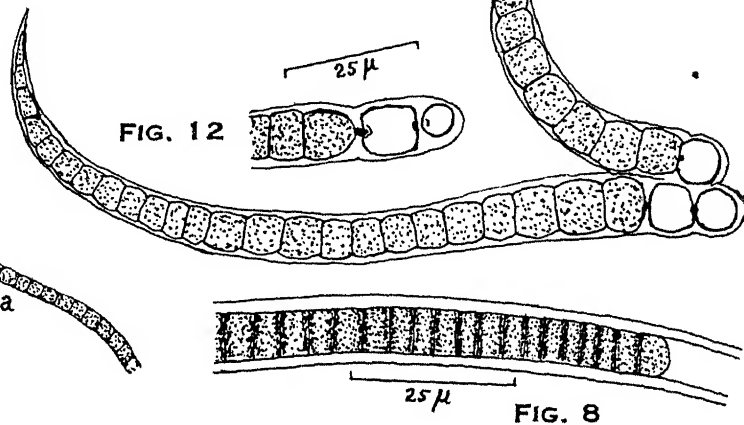
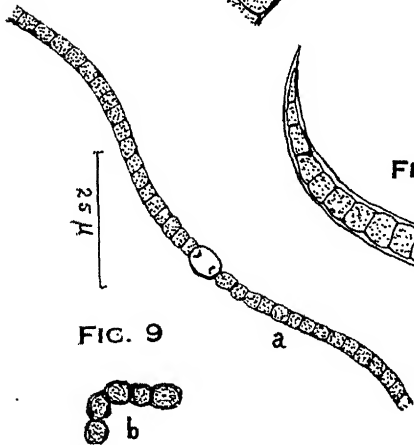
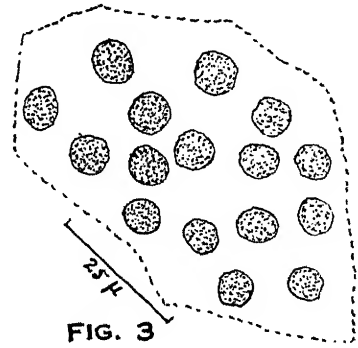
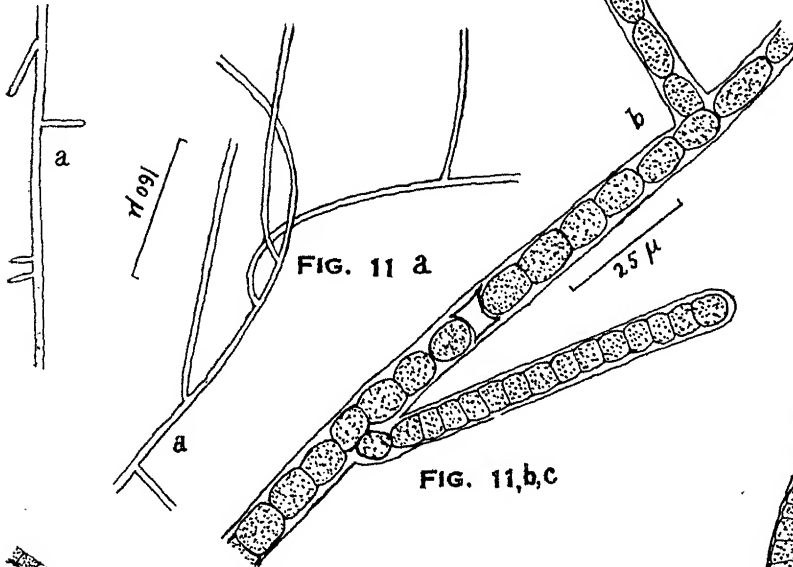
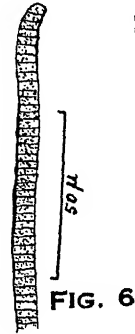
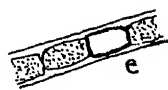
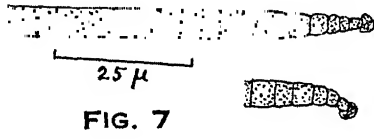
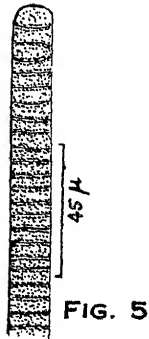
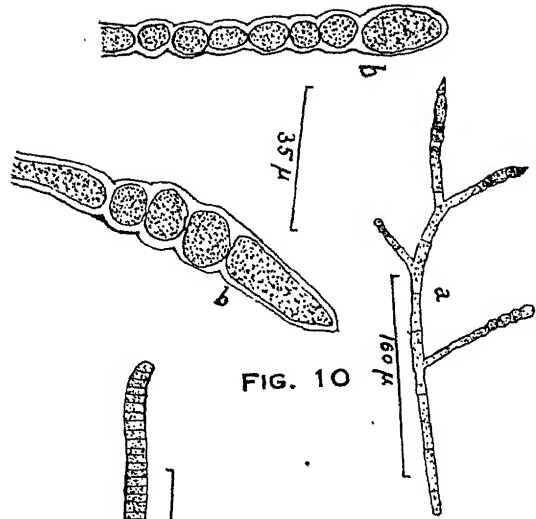
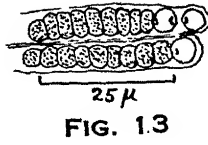
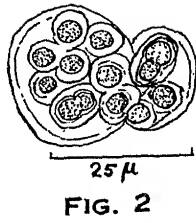
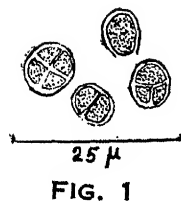
Filaments 7-8 μ thick, isolated or in small groups, the lower portion attached to the host, the remainder erect and free ending in a hair-point. Sheaths not distinct, colourless. Heterocysts 6-8 μ in diameter, basal, usually two in number, the terminal one globose, the sub-terminal one globose, elliptical or barrel-shaped.

Habit. On submerged portions of aquatic plants in stagnant ponds, intermingled with *Oedogonium* sp.

13. *Calothrix brevissima* G. S. West, Journal of Lin. Soc., Bot., Vol. 38, p. 180, pl. 10, fig. 8; Pascher 1925, p. 221, fig. 259. variety *moniliforma* var. nov.

Plate II, Fig. 13.

Filaments gregarious, 5-7 μ broad, not or very little attenuated. Sheaths indistinct, narrow, colourless. Trichomes pale olive-green, very short, 30-62 μ long, with rounded end-cell, moniliform. Cells at the base



as long as broad or shorter, globose or depressed-globose, 4-5 μ broad. In an algal culture in a large glass-dish.

Habit. In an algal culture in a large glass-dish.

The new variety is characterised by clear constrictions at the joints of the trichomes.

Conclusion.

In conclusion I have much pleasure in expressing my indebtedness to the Research Fund of the University of Rangoon for the provision of literature, some of which has been used in the preparation of this paper.

Explanation of Figures.

PLATE II.

- Fig. 1. *Chroococcus varius* A. Br.
- Fig. 2. *Gloeocapsa atrata* Kütz.
- Fig. 3. *Aphanocapsa crassa* sp. nov.
- Fig. 4. *Oscillatoria princeps* Vauch.
- Fig. 5. *Oscillatoria limosa* (Roth.) Ag.
- Fig. 6. *Oscillatoria curviceps* Ag., variety *angusta* var. nov.
- Fig. 7. *Oscillatoria amoena* (Kütz.) Gom., variety *non-granulata* var. nov.
- Fig. 8. *Lyngbya Hieronymusii* Lemm., variety *crassi-vaginata* var. nov.
- Fig. 9. *Anabaena variabilis* Kütz, *a*, part of a filament. *b*, spores.
- Fig. 10. *Westiella intricata* Borzi. *a*, part of a filament. *b*, two hormocysts.
- Fig. 11. *Hapalosiphon Welwitschii* W. & G. S. West, variety *vaginatus* var. nov. *a*, filaments showing branching. *b*, part of the filament magnified. *c*, young filament with a heterocyst.
- Fig. 12. *Calothrix scytonemicola* Tilden.
- Fig. 13. *Calothrix brevissima* G.S. West, variety *moniliforma* var. nov.

ON A COLLECTION OF MYXOPHYCEAE FROM MERGUI AND SOME NEIGHBOURING ISLANDS

BY

S. L. GHOSE, M.Sc., Ph.D., F.L.S.,
Lecturer in Botany, University College, Rangoon.

Introduction.

Last year during the month of October a collection of Blue-green Algae from Mergui and two of the neighbouring islands—Kisseraing and Medaw—was made by the writer. This paper embodies the result of the investigation of these algae; 18 species, representing 13 genera, out of which 2 species and 3 varieties are new are described or recorded.

The town of Mergui is situated on a small island, about 10 miles in diameter, and is cut off from the mainland by the estuaries of the Tenasserim river. Just south of the town is the main mouth of the river, where it is building a fairly extensive delta. Mergui is situated in latitude $12^{\circ} 27' N.$ and longitude $98^{\circ} 35' E.$ at a height of 66 ft. above the sea-level. The hottest months, namely March and April, have a mean maximum temperature of $95.5^{\circ} F.$, the highest temperature recorded being $99.4^{\circ} F.$ The coldest months, namely December and January have a mean minimum temperature of $61.4^{\circ} F.$, the thermometer never falling below $43^{\circ} F.$ The rainfall is confined chiefly to the months of May to October, during which period it averages about 145 inches the annual rainfall being about 162 inches.

Kisseraing Island lies about 40 miles south of Mergui. The village Kamaw is situated on its north-eastern coast. The Medaw Island is about 10 miles south-east of Kamaw. Both these islands have got many rubber plantations.

Most of the Myxophyceae collected were sub-aerial in habit. Only *Oscillatoria princeps* and *Osc. Annae* are aquatic. A large majority of the sub-aerial forms grow on barks of trees and in many cases form distinct societies; for instance, on the of the rubber plant *Aphanocapsa biformis*, *Aphanothece caldariorum*, *Stigonema minutum* *Scytonema ocellatum* var. *capitatum* var. nov., *Scytonema varium*, *Polychlamydom varium* sp. nov., *Schizothrix vaginata* var. *non-granulata* var. nov. are often found together. With these forms other species, like *Chroococcus turgidus* var. *solitarius* var. nov., *Gloeocapsa gelatinosa*, *Scytonema caldarium*, *Nostoc microscopicum*, *Lyngbya Kutzingiana*, *Lyngbya Ceylanica*, *Lyngbya truncicola* var. *Burmense* and *Fisherella epiphytica* sp. nov. may be variously associated.

The species described in this paper are classified according to the System given in Pascher (1925). Full descriptions, with drawings, are

given only of those species which have not been described and figured from Burma before. Slight variations in dimensions only of some forms have not been thought sufficient reasons to separate them from species which they otherwise resemble. Only when these variations are coupled with other marked differences have new varieties or species been erected.

Systematic description of the Species observed.

CHROOCOCCEAE.

CHROCCÓCCALES.

Family Chroococcaceae.

Genus *Aphanocapsa* Näg.

1. *Aphanocapsa biformis* A. Br., in Rabenh. Alg. No. 2453 ; De Toni 1907, p. 68 ; Lemmermann 1910, p. 60 ; Pascher 1925, p. 67 ; Ghose 1923, p. 336, and 1927, p. 221, pl. 11, fig. 3.

Diameter of the cell = 4-7 μ .

Habit. Kamaw, on the barks of *Hevea brasiliensis*.

Genus *Aphanothece* Näg.

2. *Aphanothece caldariorum* Richt.. Hedwigia 1880, p. 912 ; De Toni 1907, p. 79 ; Lemmermann 1910, p. 69 ; Pascher 1925, p. 71.

Plate III, Fig. 1.

Stratum slimy, expanded, pale blue-green. Cells 2.5 μ thick, 4-6 μ long, single or in pairs, with colourless and diffuse sheaths.

Habit. Kamaw, on the barks of *Hevea brasiliensis*.

Genus *Chroococcus* Näg.

3. *Chroococcus turgidus* (Kütz.) Näg., Gatt. Einz. Alg., 1840, p. 46 ; De Toni 1907, p. 11 ; Lemmermann 1910, p. 53, fig. 7 ; Tilden 1910, p. 5, pl. 1, fig. 3 ; Pascher 1925, p. 336 ; variety *solitarius* var. nov.

Plate III, Fig. 2.

Cells single, globose or elliptical, bright blue-green, with sheath 11-13 μ and without sheath 9-11 μ thick. Sheath thick, colourless, lamellose.

Habit. Kamaw, on the barks of *Hevea brasiliensis*, sticking to the old empty sheaths of other blue-green algae.

The cells do not form aggregates but individuals are more or less separate. No dividing cells or 2-celled colonies were seen. The new

variety is therefore characterised by its cells being solitary and by its peculiar habit.

Genus *Gloeocapsa* Kütz.

4. *Gloeocapsa gelatinosa* Kütz., Phyc. gen., 1943, p. 147; De Toni 1907, p. 54; Tilden 1910, p. 18, pl. 1, fig. 20; Pascher 1925, p. 89.

Plate III, Fig. 3.

Stratum lubricous, bullose, olive-green. Cells with sheaths 6-8 μ and without sheaths 2-5 μ thick, blue-green. Sheaths thick, colourless, lamellose when old, lamellae permanent.

Habit. Kamaw, on the barks of *Hevea brasiliensis*.

H O R M O G O N E A E

STIGONEMALES

Family Stigonemataceae

Genus *Fischerella* (Born. et Flah.) Gom.

5. *Fischerella epiphytica* sp. nov.

Plate III, Fig. 4

Stratum crustaceous or felt-like, expanded, dark brown. Primary filaments creeping, interwoven, 15-20 μ thick, mostly bi-seriate; cells somewhat spherical or compressed; sheath close, brownish. Branches erect, cylindrical, 11-14 μ in diameter, unilateral; cells globose, separated. Heterocysts rare, intercalary, Hormogonia 2-6 celled.

Habit. Mergui and Medaw Island, on barks of various trees.

Pascher (1925, p. 179.) includes five species in this genus, out of which *F. Caucasica* is the thickest and has the primary filament 45-95 μ in diameter. Of the others, *F. thermalis* has the primary filaments 10-13 μ thick, rarely thicker, and has brownish-yellow lamellose sheaths and quadratish cells; *F. muscicola* and *F. ambigua* are much narrower than the new species and *F. major* has uniseriate primary filaments.

Genus *Stigonema* Ag.

6. *Stigonema minutum* (Ag.) Hassal, History of the British Fresh-water Algae, p. 230, pl. 67, figs. 3-4; De Toni 1907, p. 582; Lemmermann 1910, p. 234; Tilden 1910, p. 248, pl. 15, figs. 18-19; Pascher 1925, p. 186, figs. 224-225.

Plate III, Fig. 5.

Stratum thin, crustaceous or cushion-like, fragile, dark brown. Filaments decumbent at the base, flexuous, 20-28 μ thick, richly branched, branches sometimes long similar to the primary filaments, sometimes

GHOSÉ—COLLECTION OF MYXOPHYCEAE FROM MERGUI.

very short bearing hormogones, often very much crowded on one side. Trichomes 1-6 seriate. Heterocysts not seen. Hormogones 8-13 μ thick, 25-30 μ long. The cells of old filaments develop *Gloeocapsa*-like sheaths (Plate III, Fig. 5; c; cf. Pascher 1925, fig. 225.)

Habit. Kamaw and Medaw Island, on barks of various trees.

NOSTOCALES

Family Rivulariaceae

Genus *Calothrix* Ag

7. *Calothrix thermalis* (Schwabe) Hansgirg, Österr Bot. Zeitschr., 34, 188, p. 279; Bornet, et Flahault Ann. Sci. Nat., Bot., VII, 3, 1886, p. 3; De Toni 1907, p. 625; Tilden 1910, p. 268, pl. 18 figs. 1-5; Pascher 1925, p. 223, fig. 264; Ghose 1927, p. 224, pl. 11, fig. 10.

Diameter of the filaments at the base = up to 14 μ

Diameter of the trichome at the base = up to 12 μ

Diameter of the heterocyst = 10-12 μ

Habit. Mergui, on damp cement walls.

Family Scytonemataceae

Genus *Scytonema* Ag.

8. *Scytonema caldarium* Setchell, Notes on Cyanophyceae—III, Erythea, 7, p. 48, pl. 3, fig. 3; De Toni 1907, p. 508, Tilden 1910, p. 215, pl. 12, fig. 1, Pascher 1925, p. 267.

Plate III, Fig. 6.

Stratum tufted. Filaments up to 16 μ in diameter, more or less entangled, pseudo-branches in pairs, erect, usually united together in bundles. Sheaths firm and colourless when young and lamellose and yellowish-brown when old. Trichomes 4-8 μ thick. Cells 3-8 μ in length, olive or yellowish-green. Heterocyst colourless, elongate with rounded corners.

Habit. Medaw Island, on trees, amongst mosses and lichens.

9. *Scytonema ocellatum* Lyngb., Hydrophyt. danica, 1819, p. 97, pl. 28A, De Toni 1907, p. 509; Lemmermann 1910, p. 211; Tilden 1910, p. 218, pl. 12, fig. 8; Pascher 1925, p. 272; variety *capitatum* var. nov.

Plate III, Fig. 7.

Stratum cushion-shaped, blackish. Trichomes 10-13 μ thick, entangled. Sheaths firm, thick, hyaline when young and yellowish-brown and lamellose when old, the outer lamellae being lighter in colour

than the inner ones. Pseudo-branches scarce. Trichomes 5-8 μ thick, usually swollen at the apex. Cells quadrate. Heterocysts single, somewhat quadrate, yellowish.

Habit. Kamaw, on the barks of *Hevea brasiliensis*.

The new variety is characterised by the swollen apices of the trichomes. It differs from the type-form also in the fact that its pseudo-branches are not always short.

10 *Scytonema varium* Kütz., Spec. Alg., p., 307, Tab. Phycol. II, p. 6, pl. 23, fig. 2; De Toni 1907, p. 512; Lemmermann 1910, p. 212, Tilden 1910, p. 217, pl. 12, fig. 5; Pascher 1925, p. 217; Ghose 1923, p. 343; Zeller 1873, p. 182.

Plate III, Fig. 8.

Stratum woolly, felt-like, blue-green or brownish. Filaments 12-16 μ thick, tortuous, entangled. Sheaths gelatinous, below colourless and pellucid, yellowish in upper portions. Cells 6-9 μ broad, quadratish, bluish-green or yellowish. Heterocysts quadratish or somewhat longer than broad, colourless.

Habit. Kamaw, on the barks of *Hevea brasiliensis*,

Family Nostocaceae

Genus *Nostoc* Vaucher.

11. *Nostoc microscopicum* Carmichael; Bornet et Flahault, Revis. des Nostoc., Ann. Sci. Nat., Bot., VII, 7, 1888, p. 210; De Toni 1907, p. 413; Lemmermann 1910, p. 170; Pascher 1925, p. 302; Tilden 1910, p. 176, pl. 8, fig. 5; Ghose 1927, p. 224, pl. 11, fig 9.

Diameter of the colony (=up to 15 mm.)

Diameter of the cell=5-7 μ

Diameter of the heterocyst=7 μ

Spores not seen.

Habit. Mergui, on barks of many trees.

Family Oscillatoriaceae

-Genus *Oscillatoria* Vaucher.

12. *Oscillatoria Annae* van Goor; Pascher 1925, p. 355.

Plate III, Fig. 9.

Trichomes straight or slightly flexuous, dark blue-green, slightly constricted at the joints, 8-9 μ thick. Apex attenuated, straight. Cells

GHOSE—COLLECTION OF MYXOPHYCEAE FROM MERGUI.

up to 4 μ long, not granulated at the dissepiments. Apical cell broadly pointed, without calyptra.

Habit. Kamaw, on breathing roots of mangrove trees.

13. *Oscillatoria princeps* Vauch. Hist. des Conf., p. 190, pl. 15, fig. 2; Gomont. Monogr. Oscill., 1893, p. 226, pl. 6, fig. 9; Lemmermann 1910, p. 109; De Toni 1907, p. 150; Tilden 1910, p. 62, pl. 4, fig. 3; Pascher 1925, p. 358, fig. 421; Ghose 1927a, pl. , fig. 4.

Diameter of the cell=18-24 μ .

Length of the cell=4-6 μ .

Habit. Mergui, Municipal Tank, freely floating on water.

Genus *Lyngbya* Ag.

14. *Lyngbya Kutzingiana* Kirchner, Alg. Schles., p. 242; Pascher 1925, p. 404.

Plate, III Fig. 10.

Stratum compact, lamellose, outer layers bright blue-green, inner ones more or less colourless. Filaments 4-5 μ thick, flexuous. Trichomes 3.5-4 μ thick, slightly constricted at the joints only near the apex, granulated at the dissepiments. Cells quadrate. Apical cell rounded.

Habit. Kamaw, on the barks of *Hevea brasiliensis*.

15. *Lyngbya Ceylanica* Wille; Pascher 1925, p. 406, fig 522.

Plate III, Fig. 11.

Stratum olive-green. Filaments 10-14 μ thick, straight. Sheath thin, hyaline. Trichomes blue-green, not constricted at the joints, not granulated at the dissepiments. Cells 8-12 μ broad, $\frac{1}{2}$ - $\frac{1}{3}$ times as long. Apex not attenuated. Apical cell rounded, without calyptra.

Habit. Kamaw, on the barks of *Hevea brasiliensis*.

16. *Lyngbya truncicola* Ghose 1923, p. 339, pl. 31, fig. 6; Pascher 1925, p. 406, fig. 519; variety *Burmense* Ghose 1926, p. 247, pl. 6, fig. 8.

Diameter of the filament=13-15 μ .

Diameter of the trichome=11-12 μ .

Habit. Mergui and Kamaw, on barks of many trees.

Genus *Polychlamydom* W. et G. S. West.

17. *Polychlamydom varium* sp. nov.

Plate III, Fig. 12.

Filaments 25-100 μ thick. Sheath made up of an indefinite number of layers, the innermost layers being deep brown, the outermost being

colourless and unevenly swollen, the middle layers showing gradual loss of colour from inside outwards. Trichomes 6-13 μ thick, not constricted at the joints, not granulated at the dissepiments. Cells much shorter than broad. Apex rounded.

Habit. Kamaw and Medaw Island, on the barks of various trees.

The new species resembles *Polychlamydom insigne* W. et G. S. West, but shows a much greater variety in the thickness of the sheath and has narrower trichomes. The latter species has filaments 67-105 μ thick, and trichomes 17-22 μ in diameter. Besides, while the African species is aquatic the Burmese species is aerophytic.

Genus *Schizothrix* Kütz.

18. *Schizothrix vaginata* (Nag.) Gom., *l. c.*, p. 302, pl. 7, fig. 1-4; Lemmermann 1910, p. 147; Pascher 1925, p. 421, fig. 541; *Inactis vaginata* Nag., in Kütz. Spec. Alg., p. 273, Tab. Phycol. 1, pl. 77, fig. 4, De Toni 1907, p. 354; variety *non-granulata* var. nov.

Plate III, Fig. 13.

Stratum expanded, crusteo-gelatinous, not incrustated with chalk. Filaments more or less parallel or floccuous, branched at the end. Sheaths thick, lamellose, usually attenuated at the apex, holding a few trichomes within. Trichomes 13-5 μ thick, slightly constricted at the joints, not granulated at the dissepiments. Cells mostly shorter than broad. Apex slightly attenuated, narrowly rounded, without calyptra.

Habit. Kamaw, on the barks of *Hevea brasiliensis*; Medaw Island, on various trees, amongst mosses.

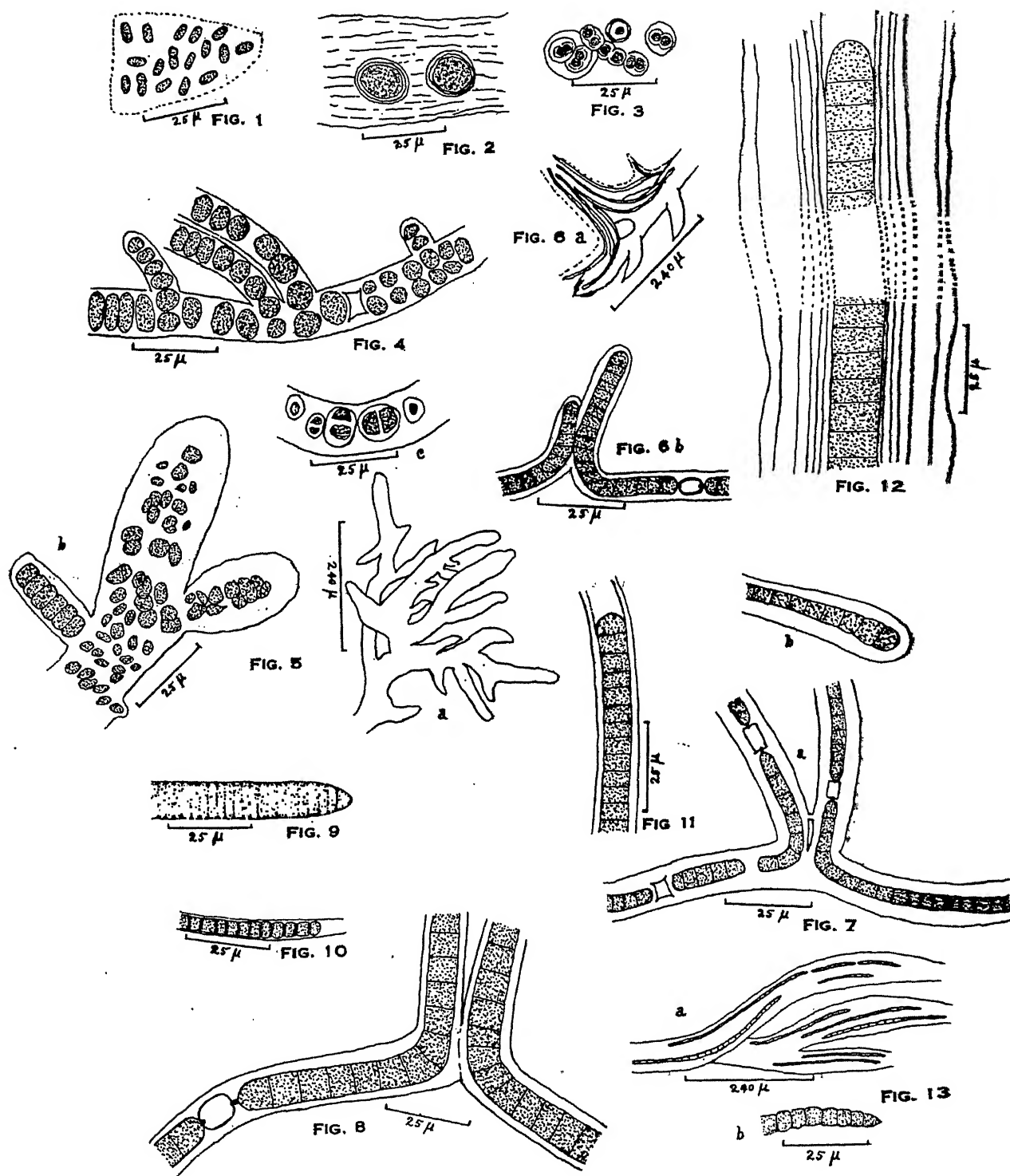
The new variety differs from the type-form in having (1) slightly constricted joints of the trichome (2) no granulations at the dissepiments (3) slightly attenuated apex.

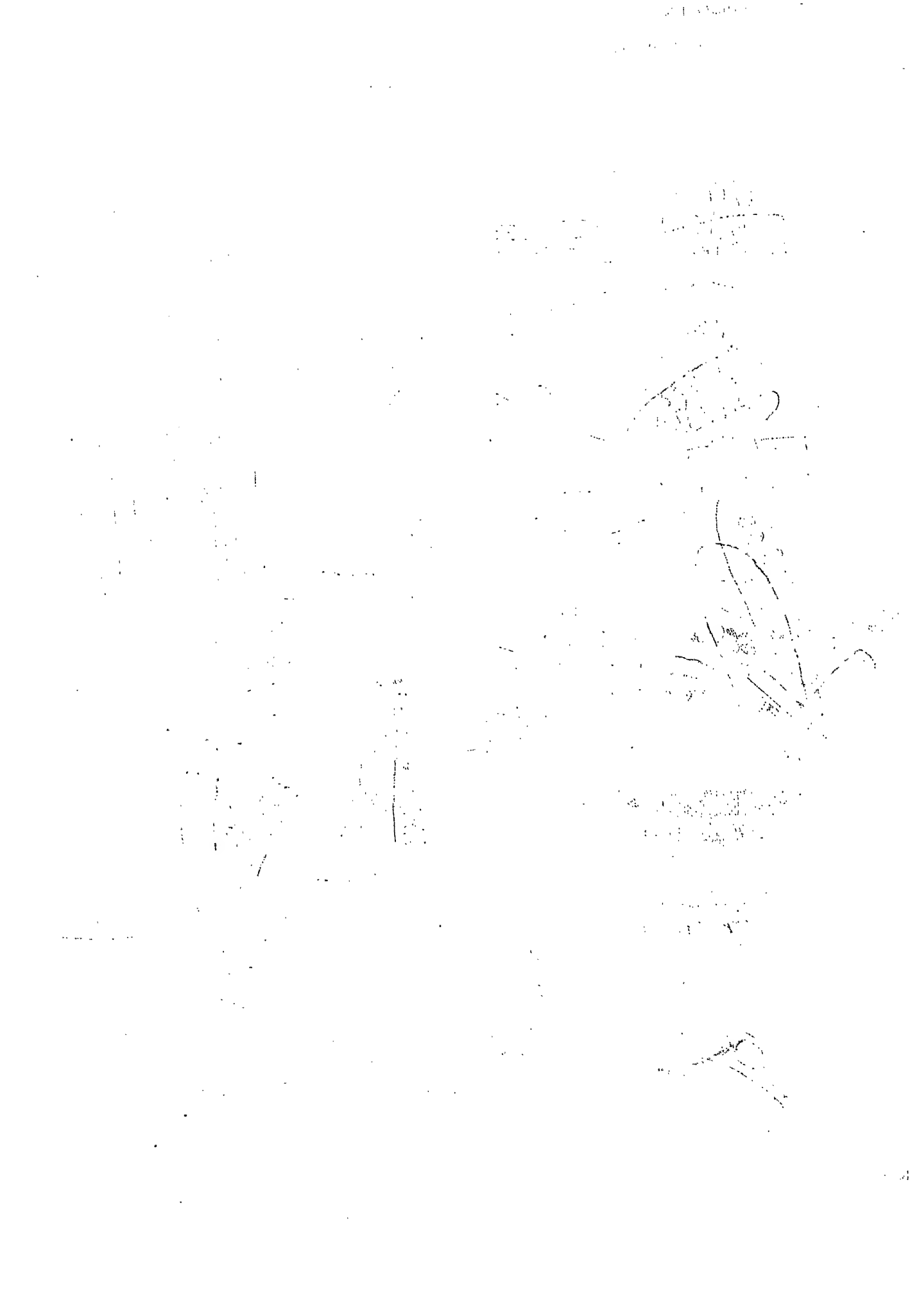
Conclusion.

In conclusion I have much pleasure in expressing my indebtedness to the Research Fund of the University of Rangoon for a grant which covered my travelling expenses and provided me with some necessary literature. To Mr. H. L. Chhibber, M. Sc., F. G. S., F. R. G. S., Head of the Department of Geography and Geology, I am grateful for supplying me with the geographical data about Mergui Islands.

Bibliography.

- De Toni, J. B. (1907). Sylloge Algarum, Vol. V. Myxophyceae. Patavia.
 Ghose, S. L. (1923). A systematic and ecological account of a collection of Blue-green Algae from Lahore and Simla. *Jour. Lin. Soc., Botany*, XLVI, 333-346.





GHOSE—COLLECTION OF MYXOPHYCEAE FROM MERGUI.

- Ghose, S. L. (1926). On some Myxophyceae from Rangoon. *Jour. Burma. Res. Soc.*, XV, Part III, 244-253.
- (1927). The Myxophyceae of Rangoon. II. *Jour. Burma Res. Soc.*, XVI, Part II, 220-226.
- (1927a) The Myxophyceae of Rangoon. III. *Jour. Burma Res. Soc.*, XVII, Part III.
- Lemmermann, E. (1910). Kryptogamenflora der Mark Brandenburg. Algen 1. Leipzig.
- Pascher, A. (1925). Die Süßwasser-Flora Deutschlands, Österreichs und der Schweiz. Heft 12: Cyanophyceae. Jena.
- Tilden, Josephine (1910). Minnesota Algae. Vol. I. The Myxophyceae of North America and adjacent regions, etc. Minneapolis, Minnesota.
- Zeller, G. (1873). Algae collected by Mr. S. Kurz in Arracan and British Burma, etc. *Jour. Asia. Soc. of Bengal* XLII, Part II, No. 3, 175-194.

Explanation of Figures.

PLATE III.

- Fig. 1. *Aphanothece caldariorum* Richt. A portion of the thallus.
- Fig. 2. *Chroococcus turgidus* (Kütz.) Näg., var. *solitarius* var. nov.
- Fig. 3. *Gloeocapsa gelatinosa* Kütz.
- Fig. 4. *Fischerella epiphytica* sp. nov.
- Fig. 5. *Stigonema caldarium* (Ag.) Hassal. *a*, part of the thallus, to show the branching; *b*, a portion much magnified; *c*, a portion of an old filament showing *Gloeocapsa*-like sheaths round the cells.
- Fig. 6. *Scytonema caldarium* Setch. *a*, a bundle of pseudo-branches growing on moss; *b*, a part of a filament showing branches and heterocyst.
- Fig. 7. *Scytonema ocellatum* Lyngb., var. *capitatum* var. nov. *a*, branching and heterocysts; *b*, swollen apex of a trichome.
- Fig. 8. *Scytonema varium* Kütz.
- Fig. 9. *Oscillatoria Annae* van Goor.
- Fig. 10. *Lyngbya Kutzingiana* Kirchn.
- Fig. 11. *Lyngbya Ceylanica* Wille.
- Fig. 12. *Polycalamyduum varium* sp. nov.
- Fig. 13. *Scizothrix vaginata* (Näg.) Gom., var. *non-granulata* var. nov. *a* part of the thallus; *b*, apical portion of a trichome.

ON SOME MYXOPHYCEAE FROM MAYMYO

BY

S. L. GHOSE, M.Sc., Ph. D., F.L.S.,

Lecturer in Botany, University College, Rangoon.

Introduction

A number of Blue-green Algae from Lower Burma have already been described in this Journal (Ghose 1926, 1927*a*, 1927*b*). This year during the months of April and May a small collection of the Blue-green Algae of Maymyo was made by the writer. This paper embodies the result of the investigation of these algae; 11 species, representing 8 genera, out of which 2 species are new, are described or recorded.

Maymyo is situated on the Shan plateau, in latitude $22^{\circ} 1' N.$ and longitude $96^{\circ} 28' E.$, at a height of 3508 ft. above the sea-level. The hottest months, namely June and July have an average temperature of about $71^{\circ} F.$, while the coldest months, namely December and January have the average temperature of about $55^{\circ} F.$ The annual rainfall of the belt in which Maymyo is situated ranges between 40 and 80 inches.

The species described in this paper are classified according to the System given in Pascher (1925). Full descriptions, with drawings, are given only of those species which have not been described and figured from Burma before.

Systematic description of the species observed.

CHROOCCOCEAE

CHROOCOCCALES

Family *Chroococcaceae*

Genus *Aphanothece* Näg.

1. *Aphanothece Castagnei* (Breb.) Rabenh., Fl. Europ. Algar. II, 1865, p. 64; De Toni 1907, p. 81, Lemmermann 1910, p. 70, Tilden 1910, p. 31, pl 2, fig. 13, Pascher 1925, p. 74 fig. 63.

Plate IV, Fig 1.

Stratum amorphous, slimy, blue-green, expanded. Sheaths not visible. Cells 2.35μ thick, long, somewhat crowded.

Habit. In a pond in Botanic Gardens, intermingled with many other blue-green algae.

Genus *Chroococcus* Näg.

2. *Chroococcus giganteus* W. West, Jour. Roy. Mic. Soc., 1892, p. 741, pl. 10, figs. 59-60; De Toni 1907, p. 11; Lemmermann 1910, p. 54; Pascher 1925, p. 78, fig. 69.

Plate IV, Fig. 2.

Cells bright blue-green, in colonies of four, each cell being about $30\ \mu$ in diameter without the tegument. Colony $90-95\ \mu$ long and $80-85\ \mu$ broad. Sheaths clearly lamellose, colourless.

Habit. In a pond in Botanic Gardens, intermingled with other blue-green algae.

It is rather curious that all the colonies observed consisted of 4 cells. According to West the four-celled condition is rather rare. The diameter of the cell—probably undivided—without the integument is given by him as $54-58\ \mu$. However, the diameter of a cell in the quaternate condition, as given in his figure 59, when measured, is found to be about $30\ \mu$, so that the Burmese forms can rightly be referred to *Ch. giganteus* W. West.

H O R M O G O N E A E

NOSTOCALES

Family Rivulariaceae

Genus *Calothrix* Ag.3. *Calothrix clavatoides* sp. nov.

Plate IV, Fig. 3.

Filaments single or in small groups, up to $200\ \mu$ long, straight or curved, swollen at the base and about $14\ \mu$ broad. Sheath narrow, thin, colourless. Cells at the base discoid, $10-13\ \mu$ thick, in the middle 2-3 times as long as broad, $3-4\ \mu$ in diameter. Heterocyst basal, single globose.

Habit. In a pond in Botanic Gardens, intermingled with other algae.

The new species resembles *C. clavata* G. S. West greatly, but differs from it in having much thicker and longer filaments and in the shape of the heterocyst.

Family Scytonemataceae

Genus *Tolypothrix* Kütz.4. *Tolypothrix inflata* sp. nov.

Plate IV, Fig. 4.

Stratum floccose, blue-green or brown. Filaments 8-10 μ in diameter. Pseudo-branches single, rarely double. Sheaths thin and hyaline when young and firm and brown when old, usually well inflated at the base of the branches. Trichomes 4-5 μ thick, slightly constricted at the joints near the apex, not granulated at the dissepiments. Cells quadratish or longer than broad, with pseudo-vacuoles. Heterocysts solitary, in twos or in threes, globose elliptical or cylindrical.

Habit. In a pond in Botanic Gardens, intermingled with other algae

The new species resembles *T. tenuis*, and *T. lanata* in habit and outward appearance, but differs from both of them in some respects. The filaments are less richly pseudo-branched and the trichomes are narrower than those of the two latter species. The sheaths of *T. tenuis* when coloured, are yellow and not brown. Besides, *T. inflata* is characterised by well-marked swellings at the bases of the branches, giving the filaments a jointed appearance.

Genus *Scytonema* Ag.

5. *Scytonema caldarium* Setch., Notes on Cyanophyceae.—III Erythea, VII, 1899, p. 48, pl. 3 fig. 3; De Toni 1907, p. 508; Tilden 1910, p. 215, pl. 12, fig. 1; Pascher 1925, p. 267; Ghose 1927b, p. 247, pl. III, fig. 6.

Diameter of the filament = up to 16 μ .

Diameter of the trichome = 4-8 μ .

Length of the cell = 3-8 μ .

Habit. On the barks of various trees.

6. *Scytonema varium* Kütz., Spec Alg., p. 307, Tab. Phycol. II, p. 6, pl. 23, fig. 2; De Toni 1907, p. 512; Lemmermann 1910, p. 212; Tilden 1910, p. 217, pl. 12, fig. 5; Pascher 1925, p. 271; Ghose 1923, p. 343, 1927b, p. 248, pl. III, fig. 8; Zeller 1873, p. 182.

Diameter of the filament = 12-16 μ .

Diameter of the trichome = 6-9 μ .

Length of the cell = 6-10 μ .

Habit. On damp walls near the Wishing Well, Botanic Gardens, intermingled with liverworts and mosses.

7. *Scytonema mirabile* (Dillw.) Bornet, Bull. de la Soc. bot. France 1889, p. 55; De Toni 1907, p. 517; Lemmermann 1910, p. 212; Tilden 1910, p. 222, pl. 13, figs. 2-5; Pascher 1925, p. 272, fig. 322; Ghose 1926, p. 251, pl. 7, fig. 20.

Diameter of the filaments=15-22 μ .

Diameter of the cell=10-12 μ .

Habit. On the barks of orange trees.

Family Nostocaceae.

Genus Nostoc Vauch.

8. *Nostoc microscopicum* Carmichael; Bornet et Flahault 1888, p. 210; De Toni 1907, p. 413; Lemmermann 1910, p. 170; Tilden 1910, p. 176, pl. 8, fig. 5; Pascher 1925, p. 302, Ghose 1927, p. 224, pl. 11, fig. 9, 1927b, p.

Diameter of the cell=5-7 μ .

Diameter of the heterocyst=7 μ

Spores not seen.

Habit. On the barks of orange trees.

Family Oscillatoriaceae.

Genus Oscillatoria Vauch.

9. *Oscillatoria animalis* Ag., Flora, X, 1827, p. 632; Gomont 1883, p. 227, pl. 7, fig. 3; De Toni 1907, p. 178; Lemmermann 1910, p. 115; Tilden 1910, p. 79, pl. 4, fig. 30; Pascher 1925, p. 371, fig. 458.

Plate IV, Fig. 5.

Stratum dark blue-green. Trichome straight, not constricted at the joints, slightly attenuated and a little curved at the apex, 3-4 μ thick, blue-green. Cells mostly shorter than broad, not granulated at transverse walls. End cells sharply pointed, not capitate, without calyptra.

Habit. On the barks of orange trees.

Genus Phormidium Kütz.

10. *Phormidium Bohneri* Schmidle, Engler's Bot. Jahrb., XXX, p. 59, pl. 2 fig. 11; De Toni 1907, p. 222; Lemmermann 1910, p. 126; Pascher 1925 p. 382; Ghose 1926, p. 247, pl. 6, fig. 6.

Diameter of the trichome=1.5 μ .

Habit. On damp soil where water has stood for some time.

11. *Phormidium ambiguum* Gomont 1893, p. 198, pl. 5, fig. 10; De Toni 1907, p. 240; Lemmermann 1910, p. 127; Tilden 1910, p. 103, pl. 5, fig. 5; Pascher 1925, p. 382, fig. 483; Ghose 1927, p. 222, p. 11, fig. 4.

Diameter of the trichome=4-6 μ .

Habit. On damp soil where water has stood for some time.

Conclusion

In conclusion I have much pleasure in expressing my indebtedness to the Research Fund of the University of Rangoon for the provision of literature some of which has been used in the preparation of this paper, and to Mr. H. L. Chhibber, M.Sc., F.G.S., F.R.G.S., Head of the Department of Geography and Geology, for supplying me the geographical data of Maymyo.

Bibliography

- Bornet et Flahault** (1888). Rev. des Nostocacees heterocystees. *Ann. Sci. Nat., Ser. VII, Bot.*, 7.
- De Toni, J. B.** (1907). Sylloge Algarum, Vol. V. Myxophyceae. Patavias
- Ghose, S. L.** (1923). A systematic and ecological account of a collection of Blue-green Algae from Lahore and Simla. *Jour. Linn. Soc., Botany*, XLVI, 333-346.
- (1926). On Some Myxophyceae from Rangoon. *Jour. Burma Res. Soc.*, XV, Part III 244-253.
- (1927). The Myxophyceae of Rangoon. II. *Jour. Burma Res. Soc.*, XVI, Part III, 220-226.
- (1927a). The Myxophyceae of Rangoon. III. *Jour. Burma Res. Soc.*, XVII Part III,
- (1927b). On a collection of Myxophyceae from Mergui and some neighbouring islands. *Jour. Burma Res. Soc.*, XVIII, Part III,
- Lemmermann, E.** (1910). Kryptogamenflora der Mark Brandenburg. Algen I. Leipzig.
- Pascher, A.** (1925). Die Susswasser-Flora Deutschlands, Österreichs und der Schweiz. Heft 12: Cyanophyceae. Jena.
- Tilden, Josephine** (1910). Minnesota Algae. Vol. I. The Myxophyceae of North America and adjacent regions, etc. Minneapolis, Minnesota.
- Zeller, G.** (1873). Algae collected by Mr. S. Kurz in Arracan and British Burma, etc. *Jour. Asia. Soc. of Bengal* XLII, Part II No. 3, 175-194.

Explanation of Figures

PLATE IV.

- Fig. 1. *Aphanothece Castagnei* (Breb.) Rabenh. Part of the thallus.
- Fig. 2. *Chroococcus giganteus* W. West.
- Fig. 3. *Calothrix calvatoides* sp. nov.
- Fig. 4. *Tolypothrix inflata* sp. nov. a branchings; b, heterocysts.
- Fig. 5. *Oscillatoria animalis* Ag.

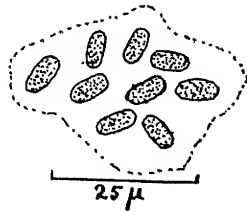


FIG. 1

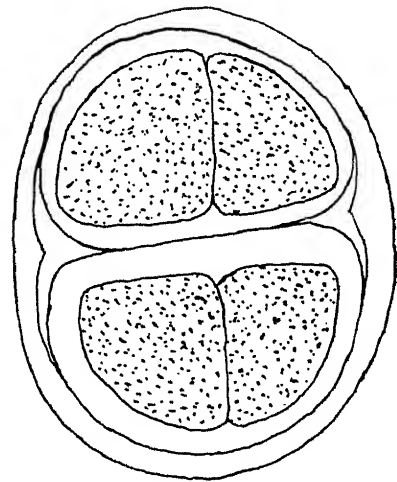


FIG. 2

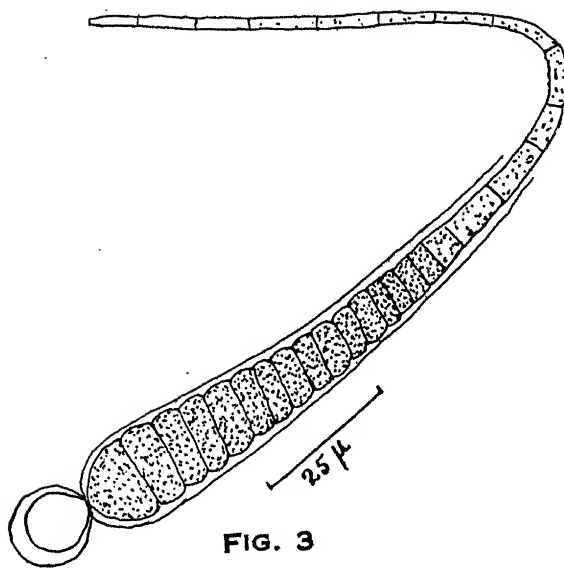


FIG. 3

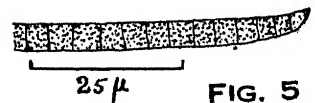
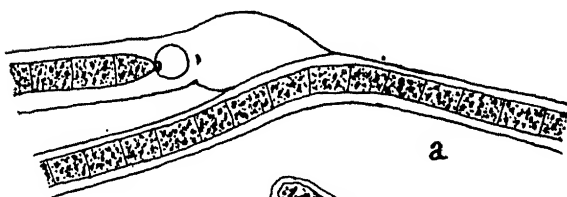


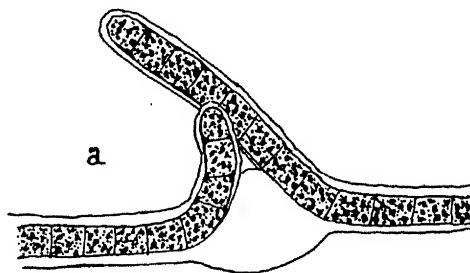
FIG. 5



a



b



a



a

FIG. 4

A NOTE ON TWO SPECIES OF *CHAETOPHORA* FROM RANGOON.

BY

M. R. HANDA, M.Sc.

(University of Rangoon).

Two species of *Chaetophora* (Schrank, 1789)—*Chaetophora elegans* (Roth) Agarth and *Chaetophora incrassata* (Hudson) Hazen collected from Rangoon, are described in the present short report. The thallus of this genus, embedded in a gelatinous matrix, has in the majority of cases some definite shape and can be readily seen with the naked eye. It is composed of numerous aggregated filaments which radiate from a somewhat central point. The filaments at their apices bear dense clusters of corymbose branches of a very bright green color. Ordinary cells possess a single parietal chloroplast with one or more pyrenoids.

Chaetophora elegans has the form of a spherical, solid, macroscopic mass of mucilage, adhering to leaves and stems of submerged aquatics, while *Chaetophora incrassata* possesses a branched and lobed thallus and is found freely floating in ponds, ditches, etc. The apices of the branches in *Chaetophora incrassata* are somewhat incurved. Both these species occur quite abundantly in Rangoon after the cessation of the rains.

It is my pleasant duty here to acknowledge the assistance derived by consultation from Dr. S. L. Ghose in connection with this short report. My sincere thanks are also due to Dr. F. J. Meggitt for his help in the collection.

1. *Chaetophora elegans* (Roth) Agarth; Pascher 1914, p. 93, figs. 134-135; West and Fritsch 1927, p. 188, fig. 71C; Tiffany 1926, p. 79, pl. 13, fig. 145; Cooke 1890, p. 273; Hassall 1857, p. 127, pl. 9, figs. 3-4; West 1907, p. 101.

Plate V, Figs. 1, 2.

Thallus bound up into a pale green, cushion-shaped mass of mucilage. Branches situated widely apart but peripheral branching dense. Cells of main branch cylindrical, only one branch being given off from a cell. Erection of branches evident. Hairs absent. Cells 8-18 μ thick, 3-9 times as long.

Habit. In stagnant ponds, attached to submerged stems and leaves.

Common and abundant.

2. *Chaetophora incrassata* (Hudson) Hazen; Pascher 1914, p. 96, fig. 143; West and Fritsch 1927, p. 188, fig. 71 A—B; Tiffany 1926, p. 79, pl. 13, fig. 144.

Plate V, Figs. 3, 4.

Main filaments grow in one direction. Branches appear either alternately or usually along one side of the main filament. Branching pseudodichotomous. End branches grow out after a penicillate manner with slightly incurved apices. Main filaments and branches ensheathed in copious mucilage. Thallus branched and elongated.

Habit . In stagnant ponds, free floating.

Not uncommon.

Bibliography.

- Cooke, M. C. (1890) : Introduction to Fresh-water Algae. London.
- Hassall, A. H. (1857) : A History of the British Fresh-water Algae. Vol. 2. London.
- Pascher, A. (1914) : Die Susswasser-flora Deutschlands, Oesterreichs und der Schweiz. H. 6 : Chlorophyceae 3. Jena.
- Tiffany, L. H. (April, 1926) : The filamentous algae of North-western Iowa with special reference to the Oedogoniaceae. *Trans Amer. Micr. Soc.*, 45, 69—132.
- West, G. S. (1907) : Report on the Fresh-water Algae, including Phytoplankton, of the Third Tanganyika Expedition, conducted by Dr. W. A. Cunningham, 1904-1905. *Jour. Linn. Soc. Bot.*, 38, 81—197.
- West, G. S. and Fritsch, F. E. (1927) : A Treatise on the British Fresh-water Algae. Cambridge.

Explanation of Figures

PLATE V.

- Fig. 1. *Chaetophora elegans* (Roth) Agarth. Shows five colonies attached to a leaf of an aquatic stem. About natural size.
- Fig. 2. *Chaetophora elegans*. Shows portion of thallus. X240.
- Fig. 3. *Chaetophora incrassata*. (Hudson) Hazen, showing lobed thallus. About natural size.
- Fig. 4. *Chaetophora incrassata*. Showing portion of thallus. X240.

A CONTRIBUTION TO OUR KNOWLEDGE OF THE GREEN ALGAE OF RANGOON

BY

M. R. HANDA, M.Sc.,

(University of Rangoon).

Introduction.

During the last two years, several individual collections of Green Algae were made by Dr. S. L. Ghose and the writer. These, it must be admitted, have not proved sufficiently representative, although the material was obtained from diverse habitats in and about Rangoon, such as stagnant ponds and ditches, damp terrestrial situations, scrapings of submerged stems and leaves, etc. More systematic collecting over a wider area is essential and will undoubtedly reveal an extremely rich Algal flora in this region. It is intended that a contribution of this nature, dealing with the various algal forms, shall appear every year.

Species of *Mougeotia* and *Zygnema* are the commonest of the sub-aerially occurring forms but are excluded from this account owing to the impossibility of identifying them in the absence of zygotes. Another common terrestrial alga is *Sirogonium sticticum*, generally found intermingled with *Oedogonium intermedium*. The aquatic members of the Zygnemales are usually slimy to touch and often form bright green masses on the surface of stagnant water. The coarser forms like *Pithophora kewensis*, which abounds in a local pond, can be readily distinguished by their harsh "feel" owing to the absence of a mucilaginous envelope and by their definite branching. Two species of *Chaetophora* are of quite general occurrence in the quiet water of ponds and ditches: *Chaetophora elegans* in the form of globular mucilaginous masses attached to submerged parts of aquatic plants and *Chaetophora incrassata* as a free-floating irregularly lobed gelatinous thallus.

A few of the free-floating planktonic forms from the Royal Lakes, such as *Pediastrum* (of which 3 new varieties are described), *Ankistrodesmus*, *Selenastrum*, *Kirchneriella*, *Scenedesmus* and *Coelastrum* are also treated in this report.

Historical Survey of Literature.

The accounts of the Green Algae of Burma that have appeared are extremely meagre. Martens (1871) was probably the first to list a few algae in Burma and the adjacent islands. To this were added by Dr. Zeller (1873) a few records of Algae collected by Kurz in Arracan and British Burma. In 1883, Theobald listed a few Burmese algae without giving any descriptions and Joshua in 1886, published an account of some Burmese Desmid-flora. Turner (1892) described and figured the fresh-water algal collections of Dr. Wallich made in 1885 from East

India but unfortunately the forms treated in his memoir were mainly Desmids, of which only a few were from Burma. In 1907, West and West published an illustrated descriptive account of fresh-water algae from Burma gathered by Burkill during the year 1904: here too, the collection only revealed a few non-Desmids.

From the above brief historical sketch of the literature dealing with the fresh-water algal flora of Burma, it is evident that the amount of information available at present regarding Burmese algae is extremely fragmentary and unrepresentative. It is proposed annually to record results of definite, systematic investigations on the Green Algae from various parts of Burma: it is certain that within a few years, there will be revealed a representative and characteristic algal vegetation.

The classification followed is that of West and Fritsch (1927) in its entirety. Altogether 22 species, representing 12 genera, are described.

Systematic description of the species identified.

Group 1. Chlorococcales.

Series 1. Zoosporinae.

Family Hydrodictyaceae.

Genus *Pediastrum* Meyen, 1829.

1. *Pediastrum clathratum* (Schroeter) Lemmermann; Pascher 1915, p. 94, fig. 56a; var. *Baileyanum* Lemmermann (= var. *duodenarium* (Bailey) Lemmermann); Brühl and Biswas 1926, p. 269, pl. 6, fig. 41a-b.

Plate VI, Fig. 1a-b.

Coenobium of 16 cells, arranged in two concentric circles, outer circle composed of 12 and the inner of 4 cells. Marginal cells triangular, with a single process, apex acuminate; central cells many-angled. Disc pierced with one central and four marginal perforations. Diameter of colony 102 μ .

Habit.—Plankton, Royal Lakes.

2. *Pediastrum duplex* Meyen; Pascher 1915, p. 95; West and Fritsch 1927, p. 114, fig. 28E; West 1907, p. 133; Turner 1892, p. 160; var. *reticulatum* Lagerheim; Pascher 1915, p. 95, fig. 57h; West and West 1907, p. 228; West 1907, p. 133.

Plate VI, Fig. 2a—b.

Coenobium composed of 8—16 cells (2+6 or 1+5+10). Disc perforated with rounded, bigger openings. Cells of periphery bilobed almost to the middle, more or less H-shaped; apices of lobes slightly bifid, Middle cells 4-lobed,

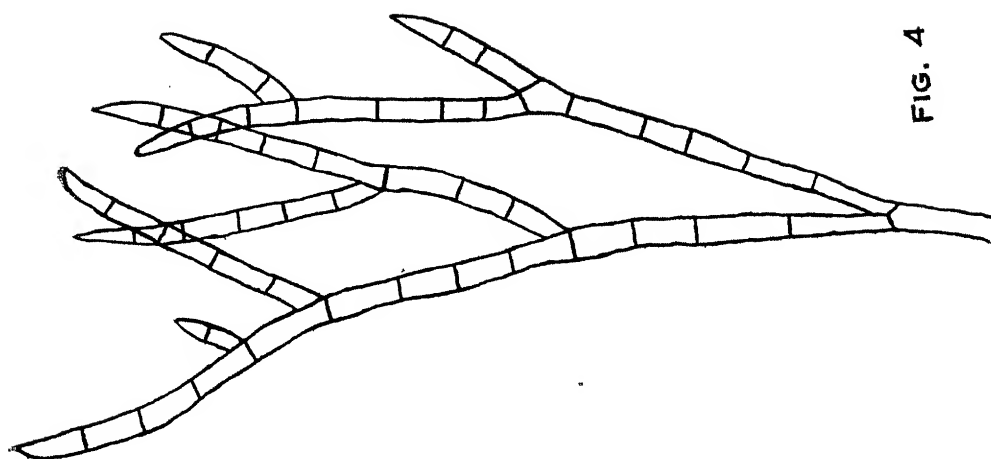


FIG. 4

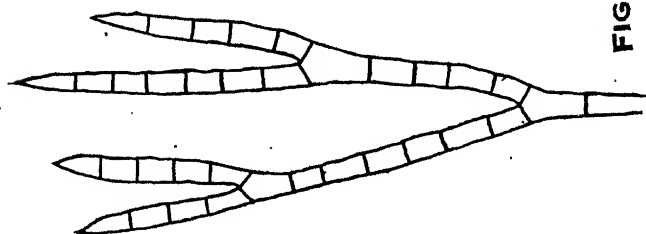


FIG. 2



FIG. 1

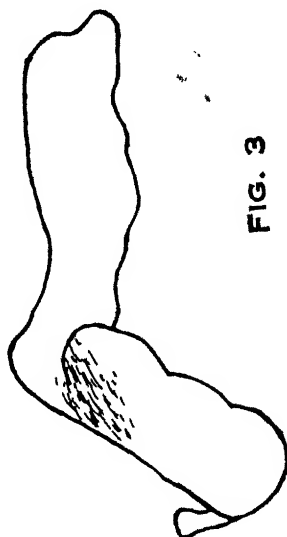


FIG. 3

Diameter of colony 58μ .

Habit.—Plankton, Royal Lakes.

3. *Pediastrum Tetras* (Ehrenberg) Ralfs; Pascher 1915, p. 103, fig. 64; West and Fritsch 1927, p. 114, fig. 28C-D; Hassall 1857, p. 388, pl. 86, fig. 17; West 1907, p. 132; West and West 1907, p. 227; Turner 1892, p. 159; Brühl and Biswas 1926, p. 271, pl. 2, fig. 18a-b, pl. 6, fig. 42; var. *burmanicum* var. nov.

Plate VI, Fig. 3.

Coenobium composed of 4 deeply but narrowly bilobed cells, arranged cruciform-fashion. Individual lobes again bipartite.

The new variety is near var. *tetraodon* (Corda) Rabenhorst but differs principally from it in the fact that the inner lobes are longer than the outer ones—a condition which is reversed in the latter.

Habit.—Plankton, Royal Lakes.

An extremely elegant species of the genus.

4. *Pediastrum Tetras* (Ehrenberg) Ralfs; Pascher 1915, p. 103, fig. 64; West and Fritsch 1927, p. 114, fig. 28C-D; Hassall 1857, p. 388, pl. 86, fig. 17; West 1907, p. 132; West and West 1907, p. 227; Turner 1892, p. 159; Brühl and Biswas 1926, p. 271, pl. 2, fig. 18a-b, pl. 6, fig. 42; var. *anamolum* var. nov.

Plate VI, Fig. 4.

Coenobium globular, of 8 (1+7) narrowly incised cells.

Diameter of colony 17μ .

Habit.—Plankton, Royal Lakes.

This new variety differs from any other in the lobes of the peripheral cells being slightly bifid, of the central cell convex,

5. *Pediastrum incavatum* Turner; Turner 1892, p. 160, t. 21, fig. 21; var. *irregularum* var. nov.

Plate VI, Fig. 5.

Diameter of coenobium 28μ . Cells 8-9 μ long, 5-6 μ broad.

Habit.—Plankton, Royal Lakes.

It differs from the type in possessing six marginal cells and in the lobes having differently defined apices.

6. *Pediastrum gracile* Al. Braun; Turner 1892, p. 160; Cooke 1890, p. 211.

Plate VI, Fig. 6.

Coenobium composed of quaternate cells, closely joined in a circle, centre closed. Cells deeply but widely bilobed, the lobes minutely bidentate at the apices.

Diameter of coenobium 45 μ .

Habit.—Plankton, Royal Lakes.

Series 2. **Autosporinae.**

Family A. **Selenastraceae.**

Genus **Ankistrodesmus** Corda, 1838.

7. *Ankistrodesmus falcatus* (Corda) Ralfs; Pascher 1915, p. 188, fig. 283; West and Fritsch 1927, p. 129, fig. 40A; West 1907, p. 140; West and West 1907, p. 230; Brühl and Biswas 1926, p. 268, pl. 2, fig. 15a-c.

Plate VI, Fig. 7.

Cells straight or slightly curved, 15-20 times as long as broad (2-3 μ) with acutely cuspidate ends, in loose aggregates or close fascicles, rarely solitary.

Habit.—Plankton, Royal Lakes.

Genus **Selenastrum** Reinsch, 1867.

8. *Selenastrum gracile* Reinsch; Pascher 1915, p. 183, fig. 274; West and Fritsch 1927, p. 132, fig. 42A-D; West 1907, p. 141; Turner 1892, p. 162.

Plate VI, Fig. 8.

Cells semi-lunar, attenuated to sharp points and arranged with the convex margins apposed to form colonies of 4 or 8.

Cells 11-13 μ long, 2-3 μ broad.

Habit.—Plankton, Royal Lakes.

Genus **Kirchneriella** Schmidle, 1893.

9. *Kirchneriella lunaris* (Kirchner) Moebius; Pascher 1915, p. 180, fig. 264; West and Fritsch 1927, p. 133.

Plate VI, Fig. 9a-c.

Colony composed of irregularly disposed cells. Cells semi-lunar, ends pointed, 3-5 μ broad, 6-10 μ long.

Habit.—Plankton, Royal Lakes.

Family B. **Coelastraceae.**Genus **Scenedesmus** Meyen, 1829.

10. *Scenedesmus obliquus* (Turpin) Kützing; Pascher 1915, p. 163, fig. 208; West and Fritsch 1927, p. 139, fig. 48A; West 1907, p. 139; West and West 1907, p. 229.

Plate VI, Fig. 10 a-b.

Cells of coenobium spindle-shaped, with sharply pointed ends; terminal cells of the row differ from the central one in being curved. Coenobium of 4-8 cells which are regularly alternate and united in a single series. Cells 14-25 μ long, 2-5 μ broad.

Habit.—Plankton, Royal Lakes.

11. *Scenedesmus quadricauda* (Turpin) Brébisson; Pascher 1915, p. 165; West and Fritsch 1927, p. 139, fig. 48D—F; Cooke 1890, p. 207; West 1907, p. 139; Turner 1892, p. 161; West and West 1907, p. 229; Brühl and Biswas 1926, p. 267, pl. 1, fig. 10a-c; var. *typicus* West and West; Pascher 1915, p. 166, fig. 223.

Plate VI, Fig. 11.

Cells composing the coenobium usually 4, straight, oblong-cylindrical, rounded at the ends, disposed in a single series. Only terminal cells furnished at each extremity with a backwardly-directed spine-like horn. Cells 10-12 μ long, 3-4 μ broad.

Habit.—Plankton, Royal Lakes.

12. *Scenedesmus bijugatus* (Turpin) Kützing; Pascher 1915, p. 167, West and Fritsch 1927, p. 139, fig. 48 C; West 1907, p. 138; West and West 1907, p. 229; Brühl and Biswas 1926, p. 267; var. *seriatus* Chodat; Pascher 1915, p. 166, fig. 223.

Plate VI, Fig. 12.

Cells longish-ellipsoidal, obtuse at the ends, arranged in a single row. Coenobium of 4 cells which show a very slight regular alternation.

Habit.—Plankton, Royal Lakes.

Genus **Coelastrum** Naegeli, 1849.

13. *Coelastrum microporum* Naegeli; Pascher 1915, p. 195, fig. 307; West and Fritsch 1927, p. 142; Cooke 1890, p. 213; West 1907, p. 135; Brühl and Biswas 1926, p. 268, pl. 2, fig. 16a-c; Turner 1892, p. 161, t. 20, fig. 11.

Plate VI, Fig. 13.

Coenobium globular, composed of 16 cells. Cells almost spherical, 11-14 μ in diameter. Intercellular spaces very small, much smaller than the diameter of cells.

Diameter of coenobium 45-48 μ .

Habit.—Plankton, Royal Lakes.

The new species *Coelastrum indicum* described by Turner (1892) is in all probability the same as *Coelastrum microporum* Naegeli.

Group 2. Ulotrichales.

Series A. Eu-Ulotrichales.

Family Ulotrichaceae.

Genus *Ulothrix* Kützing, 1833.

14. *Ulothrix tenerrima* Kützing; Pascher 1914, p. 32, figs. 28-30; Cooke 1890, p. 267; West 1907, p. 100; Turner 1892, p. 162.

Plate VI, Fig. 14.

Cells 7-9 μ thick, $\frac{2}{3}$ — $1\frac{1}{2}$ times as long. Filaments slightly lubricous. Chloroplast ring-shaped, with a single pyrenoid.

Habit.—On damp pieces of bricks, near a water-tub, University College compound.

Series B. Cladophorales.

Family Cladophoraceae.

Genus *Pithophora* Wittrock, 1877.

15. *Pithophora kewensis* Wittrock; Pascher 1921, p. 62, fig. 56; West and Fritsch 1927, p. 172; Cooke 1890, p. 247.

Plate VII, Figs. 15—19.

Thallus richly branched, with the habit of *Cladophora*. Filaments 55-58 μ thick, with solitary branches which arise a little way below a septum. Akinetes terminal and intercalary. Terminal akinetes ovoid, with a broad base and a rounded top, 56 μ thick, 155-183 μ long. Intercalary akinetes cask-shaped, 50-78 μ thick, 166-244 μ long. Basal hapteron well developed. Plants densely loaded with epiphytes, consisting of a great variety of Diatoms, *Oedogonium ciliatum* (Hass.) Pringsheim, and the other unidentified smaller members of the genus *Oedogonium*.

Habit.—Roadside pond, near Old Race Course.

In the vegetative state, *Pithophora* and *Cladophora* are indistinguishable from each other, the only diagnostic character being the enlarged akinetes present in the former.

Group 3. Chaetophorales.

Family Chaetophoraceae.

Sub-family Chaetophoreae.

Genus *Chaetophora* Shrank, 1789.

16. *Chaetophora elegans* (Roth) Agarth.

For description, see preceding paper.

17. *Chaetophora incrassata* (Hudson) Hazen.

For description, see preceding paper.

Group 4. Oedogoniales.

Family Oedogoniaceae.

Genus *Oedogonium* Link, 1820.

18. *Oedogonium ciliatum* (Hass.) Pringsheim; Pascher 1914, p. 183, fig. 252; West and Fritsch 1927, p. 221, fig. 91C; Tiffany 1926, p. 106, pl. 9, figs. 98—99; Cooke 1890, p. 255; *Vesiculifera ciliata* Hassall 1857, p. 202, pl. 52, fig. 2.

Plate VII, Fig. 20.

Dioecious, nannandrous, gynandrosporous; oogonia single or 2—3, oviform to oviform—ellipsoid, operculate, division superior; oospores ovoid, nearly filling oogonium, spore wall smooth; androsporangia to 8-celled; basal cell elongate; terminal cell drawn out into a bristle-like extension; antheridia 1-celled; vegetative cells 19—22 μ thick, 35—92 μ long; oogonia 52 μ thick, 62 μ high; oospores 46 μ thick, 52 μ high; antheridial cell 8—10 μ thick, 9—11 μ long.

Habit.—As epiphytes on *Pithophora kewensis* Wittrock in a roadside pond, near Old Race Course.

19. *Oedogonium intermedium* Wittrock; Pascher 1914, p. 207, fig 301.

Plate VII, Fig. 21a-b.

Monoecious; oogonia single, globose or ovoid, with superior pore; oospores globose or ovoid, filling the oogonia, spore wall smooth;

antheridia 1-4 celled, epigynous or hypogynous; sperms two, division horizontal; vegetative cells $11-18\mu$ thick, $22-69\mu$ long; oogonia $33-36\mu$ thick, $33-39\mu$ high; oospores $30-33\mu$ thick, $28-33\mu$ high; antheridial cells $12-13\mu$ thick, $4-11\mu$ long.

Habit.—On sandy soil, generally associated with *Sirogonium sticticum* Kützing.

20. *Oedogonium sociale* Wittrock; Pascher 1914, p.193, fig. 271; West and West 1907, p. 180.

Plate VII, Figs. 22-24.

Dioecious, macrandrous; oogonia single, generally terminal (rarely intercalary), globose, with a median pore; oospore globose, nearly filling the oogonium, spore membrane smooth; antheridia 2-6 celled; sperms two, division vertical; vegetative cells $14-22\mu$ thick, $30-96\mu$ long; oogonia $41-49\mu$ thick, $49-55\mu$ high; oospores $44-49\mu$ in diameter; antheridial cells $18-19\mu$ thick, $12-15\mu$ long.

Habit.—As epiphytes on an unidentified aquatic stem.

Group 5. *Conjugatae*.

Series *Euconjugatae*.

Family A. *Zygnemaceae*.

Genus *Spirogyra* Link, 1820.

21. *Spirogyra decimina* (Müll.) Kützing; Pascher 1913, p.27, fig. 32; Tiffany 1926, p. 82; *Spirogyra porticalis* var. *decimina* Cooke 1890, p. 225; Martens 1871, p. 464; Zeller 1873, p. 185; Theobald 1883, p. 21; West 1907, p. 106; West and West 1907, p. 186.

Plate VII, Figs. 25-26.

Vegetative cells $44-46\mu$ thick, 2—7 times as long, with simple cross-walls; 2—3 chloroplasts (generally 3) with 1—2 spirals. Fruiting cells not swollen. Zygote broad oval, $44-50\mu$ thick, $66-78\mu$ long.

Habit.—Ponds near Kokine. A very common alga.

The above plant differs from the type in having slightly larger dimensions and in the presence of generally three chloroplasts. This difference has also been noted by West and West (1907).

22. *Spirogyra turfosa* Gay; Pascher 1913, p. 29, fig. 38.

Plate VII, Figs. 27-29.

Vegetative cells $72-83\mu$ thick, 2-8 times as long, with smooth cross-walls; 3-4 chloroplasts with $1\frac{1}{2}$ —4 spirals. Fruiting cells not swollen. Zygote ellipsoid, with pointed ends, 67μ thick, about two times as long.

HANDA.—CONTRIBUTION TO KNOWLEDGE OF GREEN ALGAE OF RANGOON.

Habit.—Ponds near Insein.

Family B. Mougeotiaceae.

Genus *Sirogonium* Kützing, 1843.

23. *Sirogonium sticticum* Kützing: Cooke 1890, p. 229; West and Fritsch 1927, p. 249, fig. 99 A—C; *Spirogyra stictica* Willie, Pascher 1913, p. 32, fig. 47.

Plate VII, Figs. 30—32.

Vegetative cells 33–41 μ thick, 4–9 times as long, with generally two more or less straight, longitudinal chloroplasts. Conjugating cells coming into contact by genuflexion which is especially seen in the female cells; no distinct tubes are formed. Fruiting cells swollen and abbreviated. Zygote elliptical, 63–80 μ thick, $1\frac{1}{4}$ to $1\frac{1}{2}$ times as long.

Habit.—On sandy soil, generally associated with *Oedogonium intermedium* Wittrock. Common.

This species is remarkable for the direct conjugation of cells, without the intervention of transverse communication tubes and at the point of union, the filaments show angular flexion.

Conclusion.

In conclusion, I here wish to express my grateful acknowledgement to Dr. S. L. Ghose for his valuable help and critical suggestions so generously given me during the preparation of this paper. It is not too much to say that without his help, publication in the present form would have been impossible. To Dr. F. J. Meggitt, I am greatly indebted for the assistance he rendered me in the collection of some of the material from out of the way habitats.

Bibliography.

- Brühl, P. and Biswas, K. (1926): Algae of the Loktak Lake. *Mem. Asia. Soc. Bengal*, 8, 257—316.
- Cooke, M. C. (1890): Introduction to Fresh-water Algae. London.
- Hassall, A. H. (1857): A History of the British Fresh-water Algae. Vol. 2. London.
- Joshua, W. (1886): Burmese Desmideae, with descriptions of new species occurring in the neighbourhood of Rangoon. *Jour. Linn. Soc. Bot.*, 21.

- Martens, G. V.** (1871): List of Algae collected by Mr. S. Kurz, in Burma and adjacent islands. *Jour. Asia. Soc. Bengal*, 60, 461—469.
- Pascher, A.** (1913): Die Susswasserflora Deutschlands, Osterreichs und der Schweiz.
H. 9: Zygnemales. Jena.
——— (1914): H. 6: Chlorophyceae 3. Jena.
——— (1915): H. 5: Chlorophyceae 2. Jena.
——— (1921): H. 7: Chlorophyceae 7. Jena.
- Theobald, W.** (1883): Burma, its people and productions. Vol. 2, Botany, 16-30. Hertford.
- Tiffany, L. H.** (April, 1926): The filamentous algae of Northwestern Iowa with special reference to the Oedogoniaceae.
Trans. Amer. Micr. Soc., 45, 69—132.
- Turner, W. B.** (1892): Fresh-water Algae (principally Desmidiace) of East India.
Kgl. Svensk. Vet.—Akad. Handl., 25, no. 5.
- West, G. S.** (1907): Report on the Fresh-water Algae, including Phytoplankton, of the third Tanganyika Expedition, conducted by Dr. W. A. Cunningham, 1904—1905.
Jour. Linn. Soc. Bot., 38, 81—197.
- West, W. and West, G. S.** (1907): Fresh-water Algae from Burma, including a few from Bengal and Madras.
Ann. Roy. Bot. Garden, Calcutta, 6, 175-260.
- West, G. S. and Fritsch, F. E.** (1927): A Treatise on the British Fresh-water Algae. Cambridge.
- Zeller, G.** (1873): Algae collected by Mr. S. Kurz in Arracan and British Burma.
Journ. Asia, Soc. Bengal, 42, 175-193.

Explanation of Figures.

PLATE VI

- Fig. 1. *Pediastrum clathratum* (Schroeter) Lemmermann.
a, colony; b, single marginal cell.
- Fig. 2. *Pediastrum duplex* Meyen, var. *reticulatum* Lagerheim. a, colony; b. single marginal cell.
- Fig. 3. *Pediastrum Tetras* (Ehrenberg) Ralfs, var. *burmanicum* var. nov.

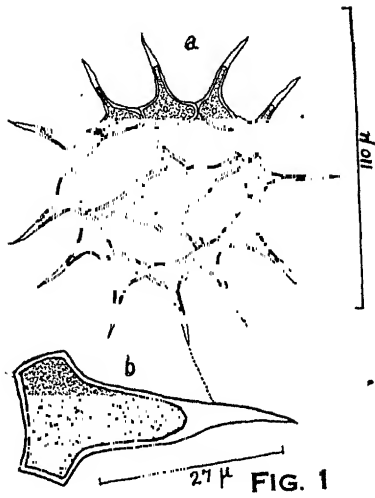


FIG. 1

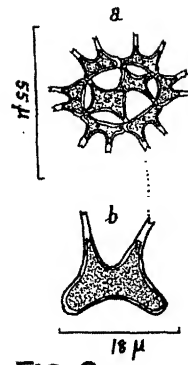


FIG. 2

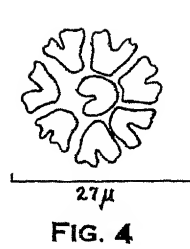


FIG. 4



FIG. 3

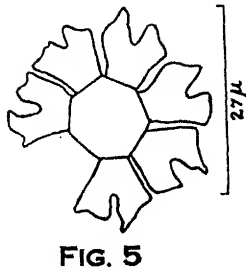


FIG. 5

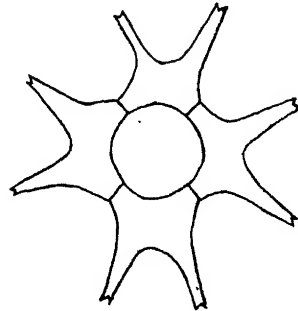


FIG. 6

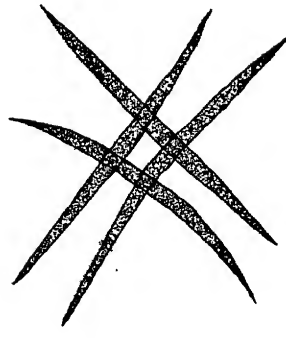


FIG. 7

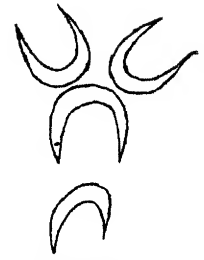


FIG. 8

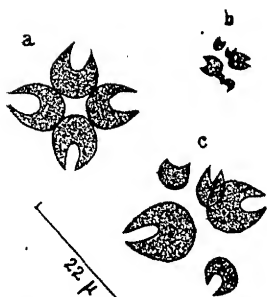


FIG. 9

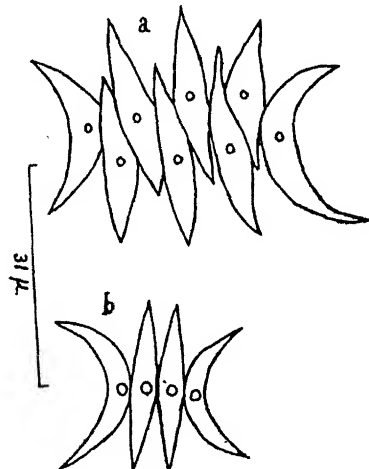


FIG. 10

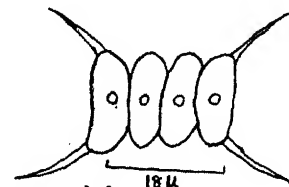


FIG. 11



FIG. 12

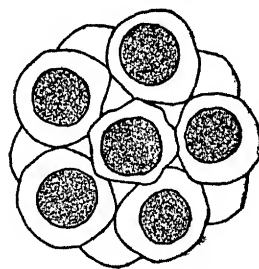


FIG. 13



FIG. 14

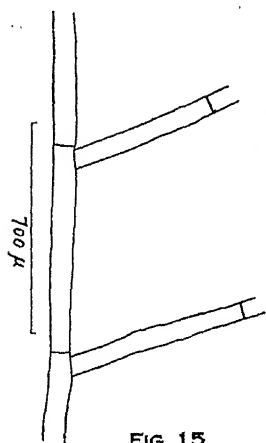


FIG. 15

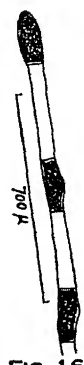


FIG. 16

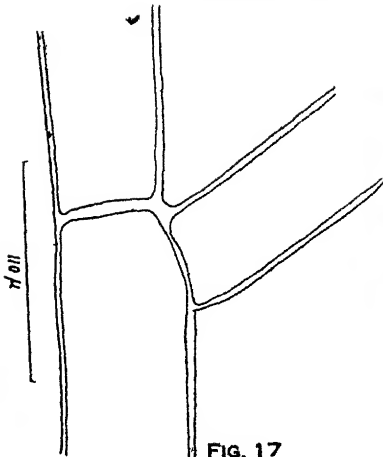


FIG. 17

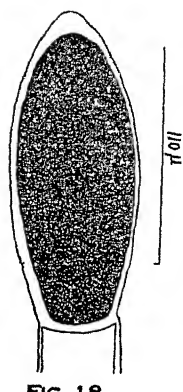


FIG. 18

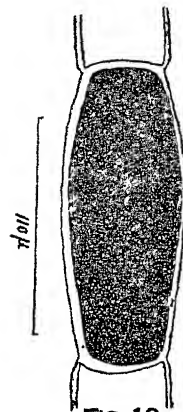


FIG. 19

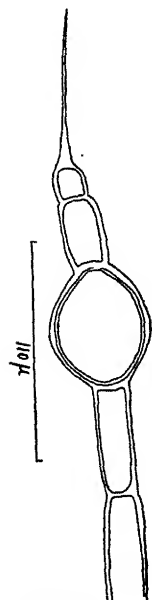


FIG. 20

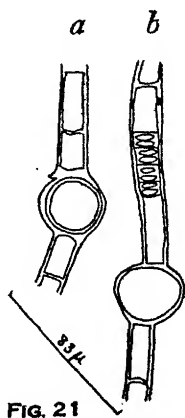


FIG. 21

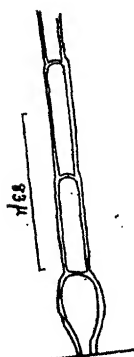


FIG. 22

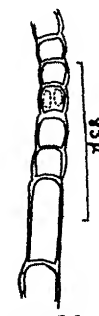


FIG. 23

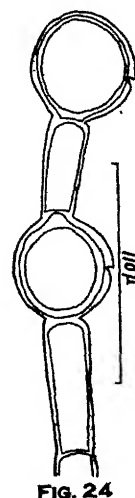


FIG. 24

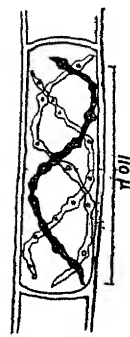


FIG. 25

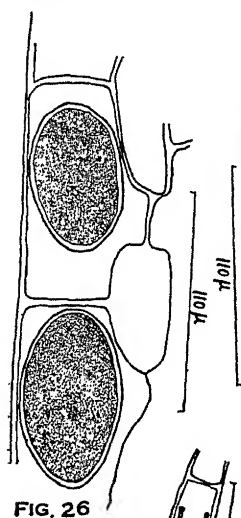


FIG. 26

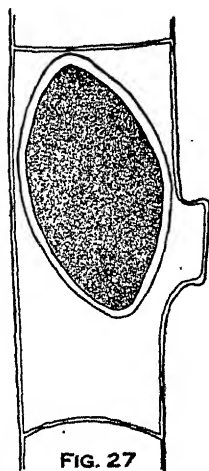


FIG. 27

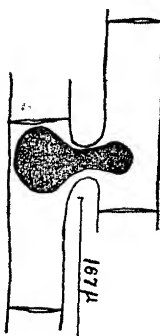


FIG. 28

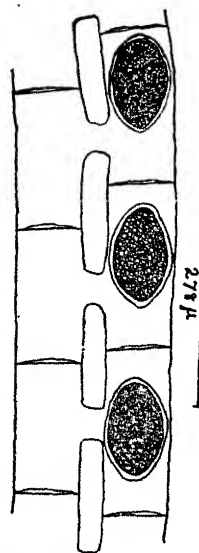


FIG. 29

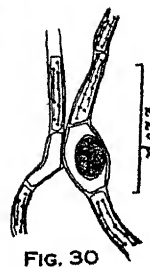


FIG. 30

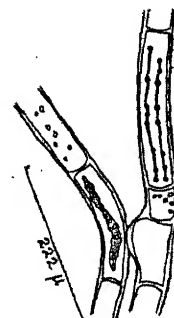


FIG. 31



FIG. 32

- Fig. 4. *Pediastrum Tetras* (Ehrenberg) Ralfs, var. *anamolum* var. nov.
 Fig. 5. *Pediastrum incavatum* Turner, var. *irregularum* var. nov.
 Fig. 6. *Pediastrum gracile* Al. Braun.
 Fig. 7. *Ankistrodesmus falcatus* (Corda) Ralfs.
 Fig. 8. *Selenastrum gracile* Reinsch.
 Fig. 9. *Kirchneriella lunaris* (Kirchner) Moebius. a,b,c, colonies showing irregularly arranged cells.
 Fig. 10. *Scenedesmus obliquus* (Turpin) Kützing. a, colony of 8 cells; b, colony of 4 cells.
 Fig. 11. *Scenedesmus quadricauda* (Turpin) Brébisson.
 Fig. 12. *Scenedesmus bijugatus* (Turpin) Kützing, var. *seriatus* Chodat.
 Fig. 13. *Coelastrum microporum* Naegeli.
 Fig. 14. *Ulothrix tenerrima* Kützing.

PLATE VII

- Fig. 15. *Pithophora kewensis* Wittrock. A portion of thallus showing branching.
 Fig. 16. Do. A filament with akinetes.
 Fig. 17. Do. Shows branching. Highly magnified.
 Fig. 18. Do. Terminal akinete.
 Fig. 19. Do. Intercalary akinete.
 Fig. 20. *Oedogonium ciliatum* (Hass.) Pringsheim.
 Figs. 21a-b. *Oedogonium intermedium* Wittrock.
 Figs. 22-24. *Oedogonium sociale* Wittrock.
 Figs. 25-26. *Spirogyra decimina* (Müll.) Kützing.
 Figs. 27-29. *Spirogyra turfosa* Gay.
 Figs. 30-31. *Sirogonium sticticum* Kützing, showing genuflexed filaments and swollen female cells.
 Fig. 32. Do. Showing two longitudinal chloroplasts.

THE MORPHOLOG OF CYATHODIUM TUBEROSUM KASHYAP

BY

L. P. KHANNA, M.Sc.,

Assistant Demonstrator in Biology, University College, Rangoon.

CONTENTS.

I. Historical	..	..	..	..	270
II. Material and Methods	..	..	..	..	271
III. Habitat and Habit	..	..	..	..	271
IV. Structure—					
(a) Sterile Plants	..	..	..	..	272
(b) Male Plants	..	..	..	..	273
(c) Female Plants	..	..	..	..	273
V. Tubers.	..	..	..	..	274
VI. Sex Organs—					
(a) Male Receptacle	..	..	..	..	274
(b) Female Receptacle	..	..	..	..	276
VII. Sporogonium	..	..	..	..	276
VIII. General Consideration	..	..	..	..	277
IX. Summary	..	..	..	..	279
X. Bibliography	..	..	..	..	280
XI. Explanation of Plates	..	..	..	..	281

Historical.

The genus *Cyathodium* was described under the names *Synhy-menium* and *Monosolenium* by Griffith and *Riccia* by Dickson. In 1834 Kunze gave a short description of it, and created a new species, *C. cavernarum* from Cuba. No serious work was done until two more species were found by Schiffner (1898). One, recorded under the name *C. aureonitens*, from various localities, was in reality two species the large male plants, which are generally found mixed with the female, being mistaken for a part of a female, and compared with the antheridial branches of *Targionia*. The other species was named *C. foetidissimum*. Lang (1905) made a complete investigation of the morphology of *Cyathodium*, in particular of *C. cavernarum* and *C. foetidissimum*. This, until 1913, was the only valuable work on the genus. Kashyap (1914) described from Mussoorie a new species, *Cyathodium tuberosum*, which differed from the others previously known the more important characteristics being the dioecious habit, the tuber formation, and the ventral pores. Stephani (1915) described two more species. One, *C. mexicanum*, from Guadalajara and the other *C. penicillatum* from Mussoorie. It appears that he ignored the important paper of Kashyap and named the plants independently. His description is brief and does not differ from that of *C. tuberosum*. The writer is of the opinion that the two are identical and that therefore *C. penicillatum* becomes a synonym of *C. tuberosum*, the latter name being peculiarly appropriate owing to the tuber formation of the plant.

KHANNA.—MORPHOLOGY OF *CYATHODIUM TUBEROSUM* KASHYAP.

Professor Kashyap suggested to the writer to make a thorough investigation of *C. tuberosum*. The original intention was to work out the complete life history of the plant, but unfortunately this could not be accomplished as no young sporogonia could be collected nor were they available in the museum material which contained either very young female plants or fully mature sporogonia.

The work was begun and finished in the Government College Botanical Laboratory, Lahore, under the direction and guidance of Professor Kashyap, to whom the writer wishes to acknowledge his indebtedness for his untiring help and constant encouragement during the course of the work.

Material and Methods.

The material was collected from various places in Kulu and Kangra, where the writer went on a botanical excursion with Professor Kashyap in July 1925. As it was the commencement of the rains, the plants were just coming out and were very young. Only a few were collected as it was thought that more could be obtained on return, but unfortunately, the writer had to return very early and by a different route.

The material was fixed in Acetic alcohol for twenty minutes and then transferred to Abs. alcohol. This latter was changed every two hours for five times, the material then being passed through 90 per cent. alcohol and finally stored in 70 per cent. alcohol.

For staining sections a combination of Gentian Violet and Orange G was tried, the slides being kept in Gentian Violet from one minute to over night and in Orange G from 1-15 minutes; this method was not a success. Diamond Fuchsin and Light Green was tried but also without great success. Safranin with Orange G proved a satisfactory combination as did also Heidenhain's Iron Alum Haematoxylin.

Habitat and Habit.

This species of *Cyathodium* is dioecious and thus is found in three different forms—sterile, male, and female. All three kinds of plants occur in patches and overlap one another. They are found associated with other plants; the more common being *Plagiochasma*, *Anthoceros*, *Riccia*, *Notothylas*, *Targionia* and some mosses. The females are the biggest and they overlap the small males. The male plants that are found along with the female are much bigger than those found separately, which bear terminal receptacles and look like shoots because of the latter character that Schiffner compares them with the male shoots of *Targionia*. In reality there is no connection between the two.

The plants were found in shady places near water, attached to stones. When in a dark place, *e. g.*, under stones, they are yellowish or light-green, but are green when along the road or in an open place. Some collections were made from Bhago pass, about 9,500 ft. above sea-level. No plants were

seen higher than this. Other plants were collected from the wall of a well along the road side at Una.

The rains in all these places are restricted to a certain part of the year and thus the plants have to undergo a dry period. It is by the formation of tubers that this period is passed over. This species has a wide distribution throughout the Himalayas.

Structure.

Sterile Plants.—The sterile plants (Fig. 1) resemble many other *Marchantiales* in external characters. They are very variable in size which depends upon the environmental factors. Those collected from moist and shady places were as large as 1.3cm in length by 0.4cm. across, while on the other hand those obtained from exposed places were only 0.4cm by 0.2cm. The thallus may be branched once or twice dichotomously, the lobes may be linear or linear oblong. The shape of the lobes is generally linear in plants that are once dichotomously divided and in those twice dichotomously branched linear oblong. There is no distinct mid-rib on the ventral side, its position being denoted by the presence of rhizoids and scales. The cells of the ventral side are prolonged into rhizoids and contain either a few or no chloroplasts (Fig. 10).

The rhizoids are of two kinds—wide and thin-walled or narrow and thick-walled, the latter more numerous and without peg-like thickenings.

The apical region is in a depression, formed by the greater development of the lateral portions of the thallus. The growing region is protected by ventral scales, which bend over the apex and are in two rows on the ventral surface. They are very simple and do not show any distinction into appendage and basal portion. Those near the growing point (Fig. 4-6) are generally composed of a single row of cells, the number varying from two to five. An out-growth protrudes either from the basal cell or from the next. These cells contain chloroplasts. The scales behind the growing point (Fig. 7) are made up of row of cells or cell plates. The cells in the latter case are elongated, while in former may be oblong or somewhat circular. They contain chloroplasts.

In young plants no pores were seen but in older plants pores were present on the ventral side. These ventral pores (Fig. 3) so far are not known in any other *Marchantiales*. The shape and size of the pores are different in the different parts of the thallus. Those near the growing region are small and circular, the average diameter of the pore being $163\ \mu$, posteriorly the long diameter of the pore increases and the shape gradually becomes elliptical. The size of the pore near the posterior end was $225\ \mu$. In structure the pores are very simple and are surrounded by ordinary cells of the thallus. The alga which happens to grow near it (Fig. 8) appears to enter through these pores. The connection is in no way permanent but only fortuitous,

The cells of the dorsal surface (Fig. 9) contain a large number of chloroplasts and have convex outer walls. The plants are heliophobous and have a yellowish phosphorescence, the outer cells acting as lenses and concentrate the light to allow of the process of carbon assimilation, a part of the light being reflected rendering the plant phosphorescent.

In section, the thallus (Fig. 2) is seen to be made up of a single basal layer of cells, which is here and there perforated by ventral pores. Upon the single basal layer of cells the air-chambers stand. The air-chambers are roofed by epidermis, rich in chloroplasts and carries on the function of photo-synthesis.

Male Plants.—The male plants (Figs. 11—20) may occur separately or mixed up with large female plants. The male plants, that are found associated with the female are bigger than the other, maximum size is 0.8cm. in length by 0.3cm. across and have terminal receptacles. They have the same form as that of sterile plants, the only difference being the presence of male receptacles. There are no special antheridial branches; the receptacle being on the thallus proper. The position and the structure of the receptacle will be described in its proper place.

Female Plants.—The female plants are generally fan-shaped (Fig. 27) but may be linear (Figs. 28-29) or linear oblong. The fan-shaped condition is due to rapid and repeated dichotomy and thus there are many growing points on the anterior margin. The linear oblong plants measured 1.5cm. in length by 0.8cm. across, the fan-shaped 1.1cm. in length by 2.2cm. across, these measurements apply to full grown plants with sporogonia. The sporogonia are apparently on the under surface. The size and the structure of the sporogonium will be described later on. When the archegonia are very young they are protected by scales. The rhizoids and the cells of the ventral surface have the same outline and structure as those of the sterile plants. There is no difference in internal structure of the three types of thallus, (male, female and sterile) but in the female the pores are present on the dorsal side, though in some linear plants pores were seen on the ventral side also. Pores on both the sides have not been seen. The dorsal pores (Fig. 30) differ from the ventral. The former are bounded by two to three series of four to five cells each, the cells are hyaline and narrow and gradually pass into the ordinary thallus cells. The ventral pores that were seen in the linear female plants have the same structure as those on the sterile plants.

The distribution, the size and the shape of pores on the thallus are very different. Those on the anterior end are numerous, circular and small with a diameter of 117μ . The size of the pore increases posteriorly, the shape changes to elliptical and the number is much reduced. The same applies to the ventral pores. Each pore opens into an air-chamber but every air-chamber does not possess a pore.

Tubers.

All the three forms of the plant—sterile, male and female form tubers at the end of the rainy season ; this assists the plant to withstand the dry period. The tubers (Fig. 31) are formed on the apex of the sterile lobes of the male plants and the apical portions of the sterile plants. Tubers were not seen in all the female plants, only in linear or linear oblong ones. A plant may have more than one tuber. The tuber itself is 0.1cm. in length by 0.2cm. across and is covered dorsally and laterally by thick-walled, spike-like hairs directed upwards and forwards. On the under side it is covered with rhizoids and hairs and sometimes a few scales. At the base it is separated from the thallus by a constriction. After it is formed, the thallus behind dies off. Its margins face obliquely upwards, so that there is a groove in the centre. The tuber is green in colour owing to the large number of chloroplasts contained by the cells. These cells are also rich with starch grains.

When a tuber is to be formed, the rhizoids near the apical portion become more numerous and hairs begin to appear ventrally, laterally and dorsally : these protect the tuber from drought, and morphologically are modified rhizoids. Similar hairs are also described for *Dumortiera hirsuta*, where a number of the rhizoids are transformed into thick walled bristles, which may be considered protective organs of the thallus, the true nature of the bristles being shown by the transition forms. The thallus becomes denser than before tuber formation. On the anterior end is a growing point which generally divides into two before the tuber is formed. The air chambers are small and numerous, the septa separating them may be transverse or oblique : these air chambers are generally divided by horizontal septa, thereby forming more than one row of air chambers. A transverse section (Fig. 32) shows that in the centre the air chambers are in several rows, but in only a single row along the margin. In longitudinal vertical sections the tuber has a single row of air chambers near the anterior and posterior ends.

The growing point of the tuber is occupied by a single initial cell and may divide before the tuber matures, thus giving rise to more than one growing point. In longitudinal horizontal sections were seen two growing points separated by a projecting lobe (Fig. 34). The apical cell was oblong. In longitudinal vertical section (Fig. 33) the growing point is triangular in outline, cutting off segments dorsally, ventrally and laterally.

Sex organs.

Male Resceptacle—The position of the male receptacle varies (Figs. 11-20). It may be in the fork (Fig. 18) between the two branches, or lateral (Fig. 14) or even terminal. One plant may have more than one receptacle (Fig. 11) when one may be terminal and the other lateral, or one may be in the fork and the other have any other position. The many

different positions of the male receptacle have already been explained by Kashyap (1914) whose views are here adopted. When the male receptacle lies between the angles of the two branches it is owing to the division of the main shoot into two, one of which divides again, producing the male shoot, and a sterile branch. When the receptacle is lateral the main shoot forks, the one portion becoming a sterile branch, the other ending as a male receptacle. The sterile branch may or may not divide again. The receptacle is more highly developed when it is terminal. The outline of the receptacle is also variable. When the receptacle is lateral or in the fork it may be circular or elliptical or even transversely elongated. When it is terminal it is a lobed structure, the number of the lobes varying from four to nine. In the former two cases the receptacle has the form of a cushion and is marked from the thallus by a stalk-like constriction. There is no groove in this stalk-like constriction, but on the anterior side of it are a few scales. In the latter case the receptacle is separated from the thallus by a short stalk with a groove on the anterior side. The receptacle is of a composite type for when the receptacle is in the fork or lateral some branches are reproductive while the others are sterile, but where the receptacle is terminal all branches are reproductive. The terminal receptacle resembles that of *Marchantia* with the difference that here the stalk is reduced.

The top of the receptacle is crowded with the projecting openings of the chambers in which stand the antheridia. These openings are each bounded by six to eight cells. In longitudinal sections (Fig. 22) the receptacle is expanded towards the stalk-like constriction where are present the antheridial chambers. The marginal layer of the receptacle is single-layered and is continuous with the basal tissue.

The young receptacle is at first recognizable as a projecting disk of tissue (Fig. 21). At this stage there are no antheridia. The mature antheridium has essentially the same structures as those of the other *Marchantiales*. It has a short stalk of two hyaline cells and a wall composed of large clear cells containing a number of spermatocytes. When the antheridia are fully formed they lie in a regular order, the youngest next to the margin of the lobes, thus the antheridia develop in a centrifugal manner. Each opens by a pore raised above the general surface of the receptacle and is separated from its neighbours by persistent septa, thus differing from those mentioned by Lang (8) for *C. cavernarum* and *C. foetidissimum*.

The development of the antheridium is the same as in other *Marchantiales* i. e. a row of cells is formed before any vertical walls appear. (Figs. 24-26).

The male receptacles of *Cyathodium* bear no resemblance to those of *Targionia*. As has already been indicated the male receptacle of the former, under ordinary conditions, is a cushion-like unlobed structure situated on one side of a vegetative shoot or in the fork of the two

sterile branches. In plants under favourable conditions it is terminal, and is comparable with that of *Marchantia*, with the difference that here there is a short stalk and reduced assimilating tissue. In this genus therefore can be seen the actual reduction of composite receptacle into a simple cushion, by the transformation of some of the branches into vegetative shoots and the slight development of the remaining, the margin of the male receptacle thus being unlobed. This may be regarded as fresh evidence in favour of the whole-sale reduction in structure of the living Marchantiales and clearly shows that the vegetative tissue increases at the expense of the reproductive tissue.

Female Receptacle.—By the displacement of the growing region the archegonia come to lie on what is apparently the ventral surface of the thallus, though morphologically it is dorsal. Any branch may give rise to a group of archegonia. The number of female receptacles on a plant may be in some cases as many as 25, the fan-shaped female plants (Fig. 27) being more rich in female receptacles than the linear ones (Fig. 28) the number of the involucre on the latter being six at the most. The archegonia in the younger stages are protected by ventral scales. They develop in an acropetal manner, until the full number of six is formed, so that the youngest are situated furthest from the anterior margin (Fig. 36). It is clear from (Fig. 37), a longitudinal section which shows the region from which the female receptacle will arise, that the tissue underlying the archegonia is thicker than any other part of the thallus. After the full number of archegonia are formed, the group is gradually surrounded by the bilobed involucre. The development of this latter is independent of fertilization, it is throughout one layer of cells thick.

The mature archegonium consists of a short stalk, the venter and the neck. The venter is a single layer of cells thick and encloses the ovum and the relatively large venter canal cell. The neck is long and contains a number of neck canal cells, which are not separated from one another by cell walls.

Sporogonium.

The number of the involucre on a plant depends on the size of the plant, large female plants having as many as twenty-five. The number of ripe sporogonia may vary from one to four in an involucre. This latter is ovoid and opens by a circular or elliptical opening and, after fertilization, possesses stiff tuber-like hairs, a few of which are shown in (Fig. 45).

The sporogonium when young is protected by the calyptra and is oval in shape. The mature sporogonium is 0.8 mm. by 0.75 mm., consists of a foot composed of two much branched cells, a seta a single row of cells and a capsule 0.6 mm. in diameter. The capsule wall

consists of an operculum, thick walled and thin walled regions. The former (Fig. 40) in early stages consists of four cells in the outermost tier, but later these cells divide in some cases and then as many as seven were found. The apical disk consists of sixteen cells, but in some cases the number may be more, thus being unlike that of *C. cavernarum* which is only 8-celled. The diameter of the operculum being 78 μ .

The thick-walled region is somewhat brownish in colour composed of cells with annular thickenings. This thickened region occupies approximately one-third of the whole capsule. The cells in the young sporogonium are full of starch, but in the ripe sporogonium are empty. Lang (1905) compares these with tapetal cells and thinks that they have probably a nutritive function.

The capsule wall encloses the spores (Fig. 41) and elaters. The spores are spinous, the spines being numerous and conical, with a diameter of 50 μ . The size of the elater is, on the average, 536 μ . It is tri-spiral, pointed at one end and fixed to the capsule wall by the expanded opposite end. All are longer than the diameter of the sporogonium and are directed towards the centre. The number is not very large, the largest being thirty-two and the smallest sixteen. At dehiscence the apical disk is thrown off and the sporogonium opens by eight blunt teeth formed by the splitting of the upper one-third of the capsule wall. Eight elaters are attached near the eight lines of dehiscence, at the junction of the thick-walled and thin-walled region of the capsule wall, the remainder of the elaters are arranged in eight rows below these. That the elaters do not only help in the dehiscence of the sporogonium but also in the dispersal of the spores, is shown by their size and fixed position.

Fig. 44 represents a part of the longitudinal section of the sporogonium and shows the spore mother cell stage. In the section some cells are elongated and others are rounded, those elongated form elaters and those rounded spores. The spore mother cells increase in size, and tetrad division takes place without the cell becoming lobed.

General considerations.

Most authors....Cavers (1911), Campbell (1918) and Lang (1905) have placed the genera *Cyathodium* and *Targionia* in the family *Targioniaceae* on the strength of the position of the sporogonia and the development and position of male receptacles. Later Dentsch (1912) showed that the two genera differ considerably from one another; he, however, overlooked the paper of Lang (1905). The study of the Indian species of *Cyathodium* clears many points.

It is advisable here to compare the characters of the two genera.

Cyathodium.	Targionia.
1. Thallus very simple—composed of two layers of cells, separated by air chambers.	1. Thallus quite compact as in other Marchantiales.
2. Air chambers without assimilating filaments, assimilation being undertaken by the epidermis of the thallus.	2. Air chambers with assimilating filaments.
3. Pores on the thallus simple—In Indian species are present ventral pores which seem to have originated to afford the dorsal surface full facilities for the absorption of the small amount of light available and at the same time to permit gaseous exchange on the ventral surface through these pores.	3. Pore is surrounded by several concentric rings of cells. Ventral pores absent.
4. Thick-walled rhizoids without peg-like thickenings.	4. Rhizoids with peg-like thickenings.
5. Male receptacle varies in position—lateral, between the branches, and terminal. The terminal receptacle may have four to nine branches, each being represented by a lobe of disc and each with a few rhizoids and scales on the ventral surface. The receptacle differs from the Marchantia-like receptacle only in having a reduced stalk and being devoid of assimilatory tissue. In all other characters it is similar.	5. The antheridia found usually on the ventral shoots, but in some cases the main shoot itself forms antheridial cushion on the midrib.
6. The position of the sporogonium is ventral in both <i>Targionia</i> and <i>Cyathodium</i> except in <i>C. cavernarum</i> where Lang has recorded it on the dorsal surface.	
7. Cells of upper one-third of capsule wall with annular thickenings. Dehiscence of the capsule takes place by the formation of eight teeth in the upper one-third of the wall.	7. Similar mechanism absent. Only a few elater-like cells attached to the apical part of the capsule.
8. Seta represented by a row of cells.	8. Seta long and thick.
9. Foot formed of two much branched cells.	9. Foot bulbous.
10. Spore mother cells not lobed.	10. Spore mother cells deeply divided into four lobes (as in Jungermanniales).

KHANNA.—MORPHOLOGY OF *CYATHODIUM TUBEROSUM* KASHYAP.

From the above differences it is certain that the two genera are different.

It is universally recognised as a reduced genus. Lang (1905) derives it from *Targionia*, but the above arguments clearly show that it has no connection with that form.

As to the relative position of the genus *Cyathodium* in the family *Marchantiales*, since the sexual organs are the most conservative, any affinities that they may show should be considered the most definite. The male receptacle, under ordinary conditions, is a simple cushion-like structure, the position may be lateral or between the two vegetative shoots. In highly developed plants, the receptacle is terminal and is of composite nature, and is comparable with the receptacle of *Marchantia* with the difference, that the assimilating tissue is reduced and the stalk is short. The reduction in the thickness of the thallus, the absence of the assimilating filaments, and the specialization of the dorsal surface for photosynthesis, may be explained by the shady habitat of the plants, causing the function of carbon assimilation to be transferred to the epidermal cells, thereby dispensing with the necessity of assimilating filaments. The other characters, for example, the reduced *foot* and the *seta* in the sporogonium, may be regarded as changes imposed upon the reduced thallus from which the sporogonium is produced and from which it gets its food.

On the grounds of the above facts, structure and development, the writer is inclined to derive *Cyathodium* from *Marchantia*-like ancestors along a parallel line of descent to that of *Targionia*, resulting in the similar position of the sporogonia arising in both genera. This affords a striking example of parallel evolution.

Summary.

The plants are shade loving. This species is dioecious and forms tubers. Thus the plants occur in three forms—sterile, male and female.

Sterile plants may be once or twice dichotomously branched, the lobes may be linear or linear oblong. In young plants there are no pores, but in older plants the pores are present on the ventral surface. They are bounded by ordinary cells of the thallus. The ventral surface is without midrib. The scales are in two rows and are composed of rows of cells or cell plates. In structure the thallus is made up of two layers of cells thick; the layers being separated by empty air-chambers. Photosynthesis takes place in the epidermal cells.

Male plants are variable in shape, male receptacle being lateral, or terminal, or between the two branches. The general structure is the same as that of the sterile plant.

Female plants may be linear or linear oblong, but generally are fan-shaped due to repeated and rapid dichotomy. They are the largest of the 3 forms. The structure of the thallus is the same as that of the

sterile plant. The groups of archegonia on a single plant may be as many as 25 and are apparently on the under surface.

Male receptacle.—In position the male receptacle is variable like the female receptacles of *Exormotheca* and *Aitchisoniella*. The structure of receptacle is variable like its position. When the receptacle is terminal, then we have a short stalk and distinct groove on the anterior side and is a branch system; while in the cases when it is lateral or in the fork it is only a cushion-like structure, separated from the thallus by a constriction, there are a few scales on the anterior surface.

The terminal receptacle is like *Marchantia* receptacle with the difference that the stalk is short and reduced assimilating tissue.

We find in this genus the reduction of composite kind of receptacle into simple disc.

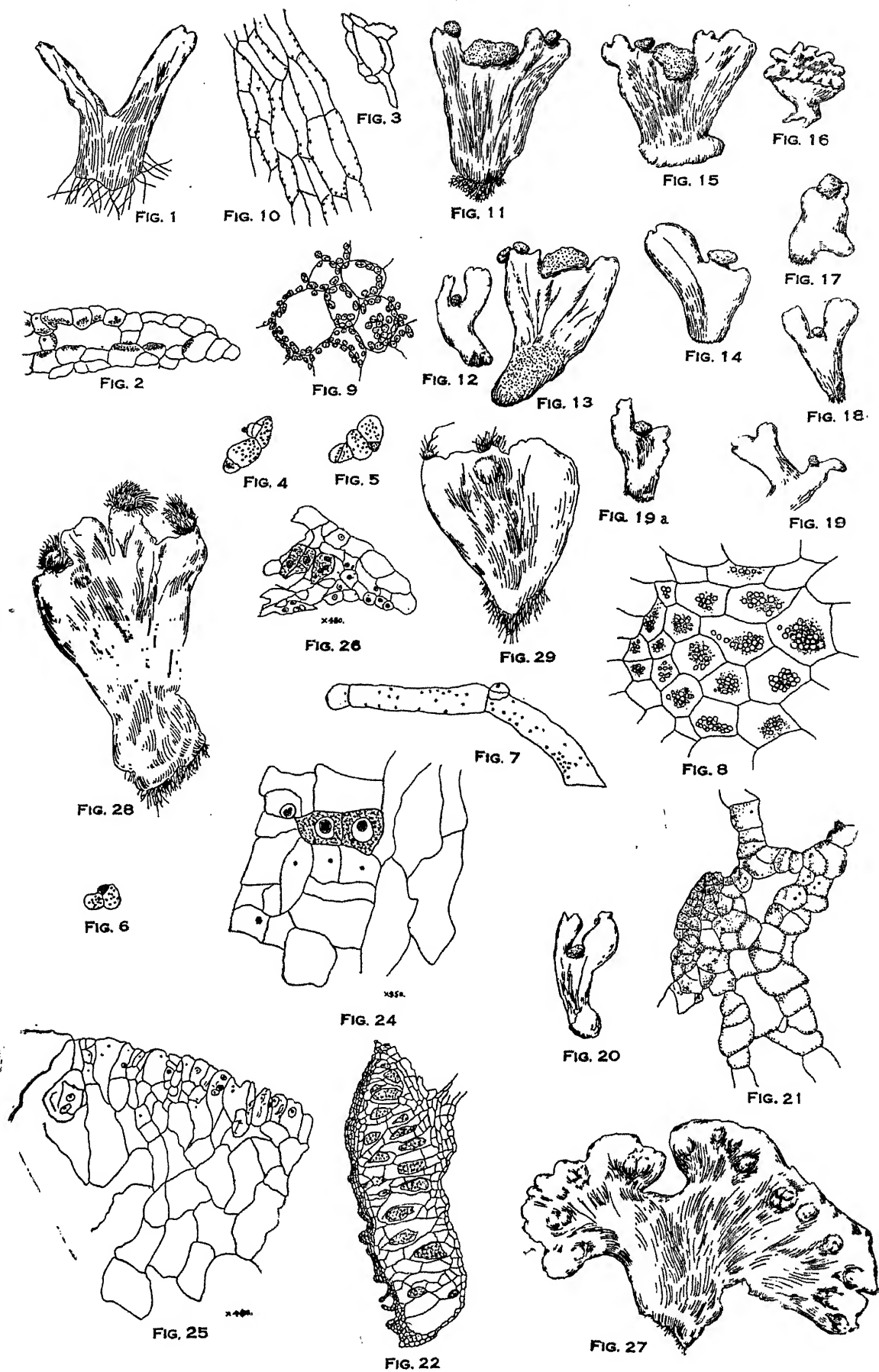
Female receptacle.—The archegonia are protected when young by scales, but when the full number is formed which is six, the involucre begins to develop. The mature archegonium has the same structure as of other *Marchantiales*. The involucre is bilobed and after fertilization hairs appear on it.

Sporogonium. An involucre may contain 1 to 4 sporogonia. Sporogonium is oval in shape. It consists of a foot, seta, and a capsule. The foot is made up of two much branched cells, while the seta of a row of cells. As usual there is an operculum, a thick-walled and thin-walled region in the capsule wall. The capsule wall encloses spores and elaters. The spores are spinous. The elaters are fixed.

The writer concludes on developmental and structural facts that the genus is reduced from *Marchantia*-like ancestors as is clearly shown from the male receptacle.

Bibliography.

1. Campbell, D. H. (1918). Mosses and Ferns, 69, 609, 612—613, 621.
2. Covers, F. (1911). Inter-relationship of the Brophyta, *New Phytologist*, Reprint 4.
3. Dentsch, H. L. (1912). A study of Targionia hypophylla, *Bot. Gaz.* 53, 492—503.
4. Goebel, K. (1907). Organography of Plants, *English Trans.*
5. Kashyap, S. R. (1914). Morphological and Biological Notes on new and little known Himalayan Liverworts.
 I. *New Phytologist*, XIII, 206—225.
 II. *New Phytologist*, XIII, 307—323.
 III. *New Phytologist*, XIV, 1—18, 1915.



L. P. K.



FIG. 33

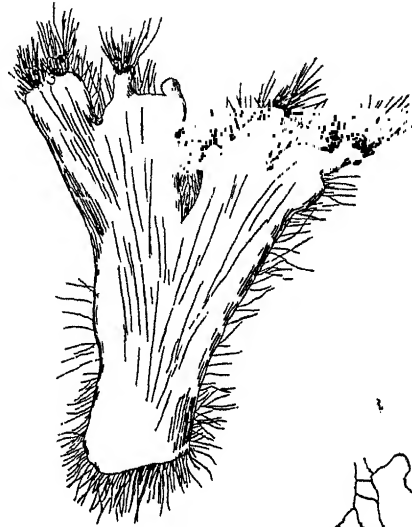


FIG. 30

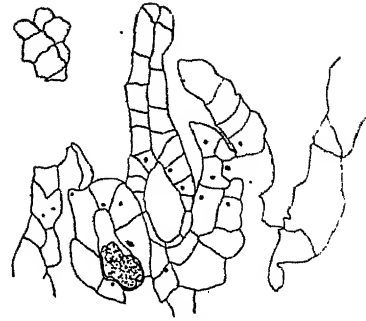


FIG. 35

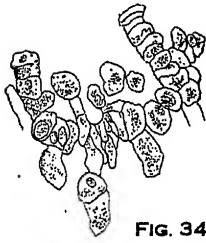


FIG. 34

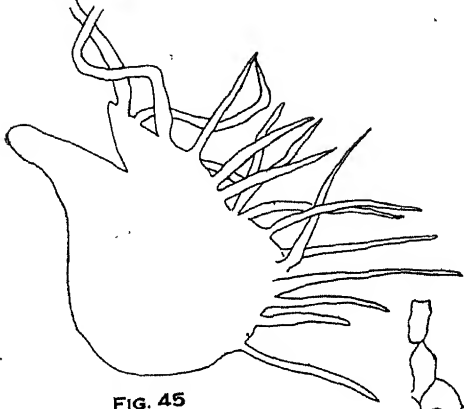


FIG. 45

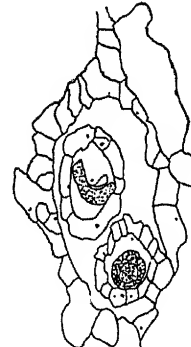


FIG. 38

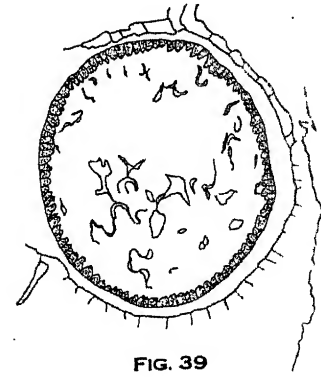


FIG. 39

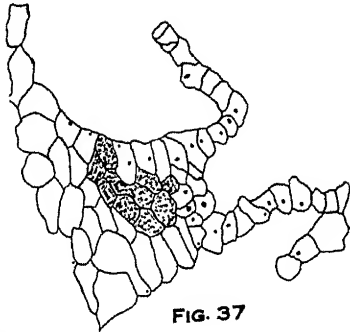


FIG. 37



FIG. 36

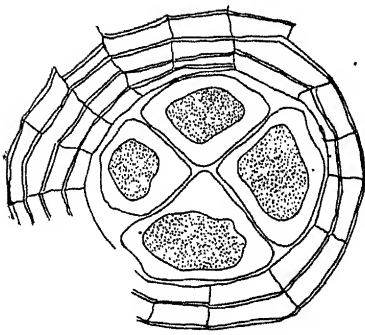


FIG. 40

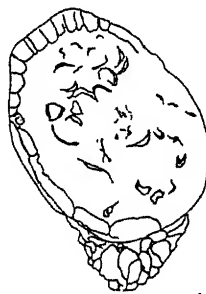


FIG. 46



FIG. 43

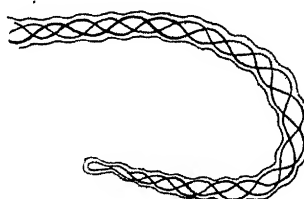


FIG. 42



FIG. 41



FIG. 32

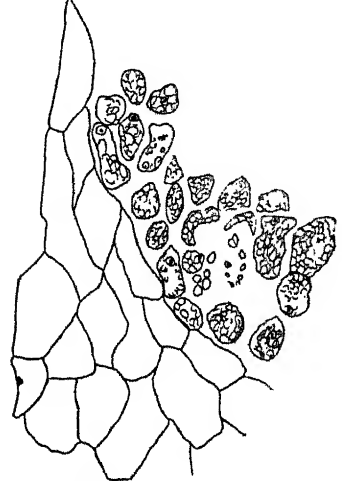


FIG. 44

KHANNA.—MORPHOLOGY OF CYATHODIUM TUBEROSUM KASHYAP.

6. Kashyap, S. R. (1919). The Relationship of Liverwärts especially in light of some recently discovered Himalayan Forms. Proceedings at the Asiatic Society of Bengal (*New series*) 15.
8. Lang, W. H. (1905). On the Morphology of Cyathodium. Ann. of Bot., 19: 583—592
9. Stephani, F—(1898-1915). Species Hepaticarum.

Explanation of Figures

PLATE VIII.

- Fig. 1. A plant of Cyathodium tuberosum X 25.
- Fig. 2. A portion of a section of the plant, showing a layered basal portion, and epidermis, separated by air chambers X 480.
- Fig. 3. Ventral pore X 480.
- Fig. 4-6. Scales near the growing point X 480.
- Fig. 7. Scales behind the growing point X 480.
- Fig. 8. A portion of the thallus, seen from the dorsal surface, and showing the blue-green Alga in the thallus X 440.
- Fig. 9. A portion of the thallus, showing the cells of the dorsal surface X 440.
- Fig. 10. A portion of the thallus, showing the cells of the ventral surface X 103.
- Fig. 11-20 Male plants, showing the various positions of male receptacle X 25.
- Fig. 21. L. S. of a young male receptacle, showing the cushion-like formation X 480.
- Fig. 22. L. S. of the male receptacle X 103.
- Fig. 24. A part of the young male receptacle, showing two-celled stage in the history of antheridium development X 950.
- Fig. 25. Three-celled stage X 440.
- Fig. 26. Four-celled stage X 440.
- Fig. 27. Fan-shaped female plants as seen from above.
- Fig. 28-29 Linear female plants with tubers X 25.

PLATE IX.

- Fig. 30. A sterile plant with tubers X .
- Fig. 31. A tuber, showing only very few hairs X 103.
- Fig. 32. T. S. of the tuber X 103.
- Fig. 33. A parting L.H. S. of the tuber showing two growing points X 480.

- Fig. 34. A portion of the L. V. S. showing triangular growing point X 480.
- Fig. 35. L. S. the female plant showing archegonia X 480.
- Fig. 36. The same X 480.
- Fig. 37. The part of the thallus from where the archegonia will arise X 440.
- Fig. 38. T. S. of a receptacle showing the eggs and one-celled involucre X 480.
- Fig. 39. T. S. of the sporogonium.
- Fig. 40. operculum as seen from above X 480.
- Fig. 41. Spore X 480.
- Fig. 42. An elater, only a part X 480.
- Fig. 43. Young sporogonium, only an outline X 103.
- Fig. 44. The same, only a portion, showing the spore-mother cell stage X 440.
- Fig. 45. An involucre, bilobed, showing only a few hairs.
- Fig. 46. L. S. of the sporogonium X 103.



↓
2

Dr

"A book that is shut is but a block"

CENTRAL ARCHAEOLOGICAL LIBRARY
GOVT. OF INDIA
Department of Archaeology
NEW DELHI.

Please help us to keep the book
clean and moving.